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ABSTRACT

The Tel-Ed '93 conference, "Global Connections," was intended to enable educators, administrators, researchers, and industry representatives to learn of the many new and innovative applications, important research studies, best practices, and national and international policy issues in educational telecommunications. The goal was to assist individuals concerned with the educational applications of telecommunications to use new resources and tools to improve the educational systems of their respective countries and, ultimately, to the benefit of humankind. The topics covered in this proceedings range from the theoretical to the practical, they focus on the primary to the adult learner, and they cross all disciplines. The following major themes are identified in the introduction to the proceedings: (1) New Partnerships; (2) Focus: The School; (3) Funding Sources; (4) Building Global Communities: Insights from Multi-National Projects; (5) Infrastructure in Action--State/District Initiatives; (6) Building Teacher Communities; (7) Perspectives on the Internet; (8) Software Tools and New Models for Interconnectivity; and (9) Telecommunications in Education: Current Practice and Trends. The proceedings are arranged chronologically by the panel, cluster, highlight, and theme sessions offered at the conference. The full text of the papers presented is included. (TMK)

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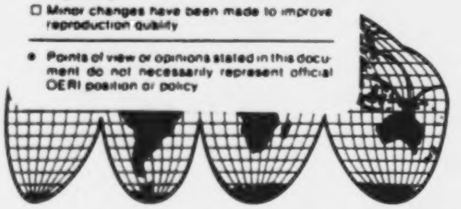

Tel•Ed '93

Global Connections

CONNECT WITH
TELECOMMUNICATIONS
LEADERS FROM ALL
OVER THE GLOBE

NOVEMBER 10-13, 1993

THE INFOMART

DALLAS, TEXAS, USA

◆ PRESENTED BY ◆
THE INTERNATIONAL SOCIETY
FOR TECHNOLOGY IN EDUCATION

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PROCEEDINGS

David Foster and Deborah V. Jolly, Editors

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Preface

Computer-mediated communications and other distance learning technologies are providing learners and educators with the ability to transcend time and space in accessing rich information resources and in communicating and working with other educators locally, nationally, and internationally. Accelerating changes in information and communication technologies offer new opportunities to schools, colleges, and educational agencies in planning, implementing, and evaluating the new telecommunications systems and applications. It also provides a challenge to educators to stay abreast of this rapidly changing field.

Since the First International Symposium on Telecommunications in Education, sponsored by ISTE, was held three years ago, there has been unprecedented growth in educational telecommunications applications, resources, and networks. There are already over 8000 networks worldwide and the number grows daily. The development of the National Information Infrastructure (NII) in the United States is only one indicator of the growing potential and importance of telecommunications in education.

ISTE and the Sponsoring Societies are again bringing together many leaders in educational telecommunications from across the globe to share their knowledge and to explore new developments, strategies, and research in the use of telecommunications. The conference and the following proceedings will enable educators, administrators, researchers, and industry representatives to learn of the many new and innovative applications, important research studies, best practices, and national and international policy issues in educational telecommunications.

Although we may not be able to foresee the ultimate impact and potential of the new telecommunications technologies in education, it is clear that they will become an increasingly important technological resource for learners and educators across the globe. It is hoped that the conference and proceedings will assist all concerned with the educational applications of telecommunications to use these new resources and tools to improve the educational systems of their respective countries and, ultimately, to the benefit of humankind.

Conference Chair
Paul Resta

Conference Co-Chairs
Lynne Schrum
Connie Stout

Introduction

Welcome to Tel•Ed '93: Global Connections. This is the 2nd International Symposium on Educational Telecommunications. We offer these proceedings to provide necessary background and details to enhance interaction with colleagues, to develop a framework for conceptualization of the presentations, and most especially, to give detailed information to foster follow-up reflection and action when you return to your homes.

It is clear, from even a quick browse through the proceedings, that our field of educational telecommunications represents a vast array of topics. We have been delighted with the breadth and depth of presentations. From the theoretical to the practical, focused on the primary to adult learner, and across every discipline, we are pleased to present these papers.

The proceedings are arranged chronologically, so that you can easily find out about all the sessions at a particular time. This may help you determine those presentations you wish to attend and those presenters with whom you wish to have longer conversations. Of course, some papers may offer sufficient information so that you choose not to attend the session.

Readers may want to note the way the conference is arranged. We have created some organizational structures to help focus the discussions and interactions. For example, cluster sessions appear throughout the conference and proceedings. These sessions combine two or three projects or presentations that were combined because they share goals, methods, or interest areas.

Also scattered throughout the conference and proceedings are panel sessions. These offer a depth or breadth of perspectives on a particular topic. Many have been organized by one moderator and that person often did the submission of the paper in the proceedings. Some panels and highlight sessions give an opportunity to hear one group or individual discuss a major area of controversy or significant contribution to the field.

Another main organizational structure is focused on significant themes. These themes emerged as we read the proposals and also from our perspective of the field. These Theme sessions will be offered on Friday morning, from 9:15 to 10:30. They represent a unique opportunity to participate in a discussion with many experienced educators, and then to hear a Session Chair summarize and challenge the panel and the audience. The following themes are offered:

New Partnerships: Discussions of projects and collaborations between a variety of educational stakeholders;

Focus: The School: These sessions offer a new look at the relationship between schools and their various communities;

Funding Sources: One of the most frequently asked question involves learning to garner scarce resources for creating and implementing telecommunications;

Building Global Communities: Insights from Multi-National Projects: Student researchers, computer Pals and large scale projects for middle and high school students are described in this session with educators experienced in global uses of telecommunications;

Infrastructure in Action - State/District Initiatives: Models of initiatives among various organizational structures will be presented;

Building Teacher Communities: Individuals who have successfully created educational communities of support and collaboration will share their descriptions and insights;

Perspectives on the Internet: More teachers have gained access to the Internet and new connections and projects must be created and refined. This panel offers a wealth of expertise;

Software Tools and New Models for Interconnectivity: From software to distributed networks – this session will describe creative solutions to old problems;

Telecommunications in Education: Current Practice and Trends
Two views of the vast array of uses for telecommunication – a European perspective and report on a large United States survey.

In addition to the above themes, we have woven a rural thread throughout the conference and proceedings. Special panels, workshops, cluster sessions and project presentations demonstrate the commitment and importance attached to this topic.

Finally, it is important to look forward to the future and to the innovations and creations that might occupy our thoughts at the next symposium. We doubt four years will pass before we meet again – as happened between the First and Second International Symposia. We take a moment to wonder where the field might be heading. It seems clear that education will move beyond the accumulation of hardware, beyond having to justify the very notion of telecommunications in our classrooms.

Philosophers, educators and others will continue to debate the essence of an educated human. Yet already many agree that individuals must have the abilities to communicate with others, to participate in collegial activities, to access and manipulate information, and most importantly, to turn information into knowledge to make wise and appropriate decisions that benefit the entire global village. We look toward that time and are certain that the presentations we see this week will help move us in that direction.

Betty Collis
Lynne Schrum
Program Co-chairs

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Provides workforce reengineering consulting, utilizing Task Analysis Process, Continuous Process Improvement and Distance Learning Network solutions. Implements multi-media distance learning networks, designs and/or converts training curriculum and provides distance learning consulting.

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Consortium for School Networking (CoSN)

The Consortium for School Networking (CoSN) is a membership organization of institutions formed to further the development and use of computer-based networking among Kindergarten through 12th grade staff and students throughout the country. CoSN seeks to assure that schools develop sound networking systems and appropriate curricular applications. Our goal is for every classroom in the country to be connected to the internet by the year 2,000.

The Consortium brings together the many groups that are or will soon be involved in K-12 networking. Membership represent educational, institutional, and commercial organizations with an interest in advancing the state of the art in all aspects of electronic computer networking.

Currently CoSN is focusing on facilitating ongoing dialogue and problem-solving between key groups by developing seminars and workshop for regional network access providers, school districts, state networks, telephone carriers, equipment vendors, foundations etc. CoSN will also be generating widespread public information regarding the benefits and potential of internetworking to K-12 education.

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International Society for Technology in Education (ISTE)

The mission of the International Society for Technology in Education (ISTE) is to promote appropriate uses of technology to support and improve teaching and learning. We support the unique needs of educators by improving access to instructional tools, initiating and endorsing relevant legislative policy issues, and holding special conferences.

ISTE is the world's largest membership society of educators committed to the improvement of K-12 education through the appropriate use of educational technology. ISTE is a nonprofit professional member organization that provides college educators, information resource managers, and K-12 educators with the latest information and resources for classroom use and integration of computer-based technology.

ISTE publishes *The Computing Teacher, the Journal of Research on Computing in Education, Educational IRM Quarterly* and other periodicals, plus an expanding line of computer education books and courseware.

ISTE maintains a network of Organization Affiliates connecting to other technology educator groups within the U.S. and abroad. ISTE has organized special interest groups for technology coordinators, teachers of educators, computer science educators, Logo-using educators, telecommunications, hypermedia/multimedia, *Microsoft Works* using educators, and English language learning educators.

With offices in Eugene, Oregon, and Arlington, Virginia, ISTE serves its membership through an array of professional career enhancement and enrichment opportunities.

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(503)346-4414 Fax: (503)346-5890 Order Phone: (800)336-5191
Internet: ISTE@oregon.uoregon.edu AppleLink ISTE

Special Interest Group on Telecommunications (SIG/Tel)

Affiliated with ISTE, SIG/Tel is a network of educators involved with computer-based communications computers alone, or combined with other media. The quarterly journal *Telecommunications in Education (T.I.E.)* reflects the SIG's interest and activities in the areas of communications, projects, research, publications, international connections, and training.

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Latin American Association for Informatics in Education (ALIE)

The Latin American Association for Informatics in Education (ALIE) is an organizational affiliate of the International Society for Technology in Education (ISTE) focused on the application of information technologies to the educational needs of Latin American countries. ALIE holds an annual meeting that brings together educational technology leaders from Mexico, Central America, South America, and Carribean countries to share information on best practices, research knowledge, and to discuss common issues, trends, and directions in the application of the new information technologies to the unique needs of their educational systems. ALIE also encourages collaborative projects and the sharing of expertise, software, and other resources between countries.

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Learning Technology Center, University of Texas at Austin (LTC)

The Learning Technology Center's mission is to conduct research and provide training, technical assistance, and information resources to facilitate the effective use of technology in learning.

The center provides support to the college and university in the application of the new information and telecommunications technologies to education. The center has a number of computer laboratories, video production studios, a media center, an instructional materials center, multimedia research facilities, and a distance learning classroom which help to prepare educators and support educational technology research and development. The center is responsible for the college electronic network and provides state, national and international leadership in educational telecommunications. It currently is engaged in research projects involving telecommunications and computer-supported collaborative learning environments.

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Southwest Educational Development Laboratory (SEDL)

A private, non-profit corporation, SEDL was established in 1966 as a regional educational laboratory to serve the Southwestern Region. Funded by the U.S. Department of Education's Office of Educational Research and Improvement, SEDL's current regional laboratory operations serve Arkansas, Louisiana, New Mexico, Oklahoma, and Texas. SEDL's mission is to challenge, support, and enrich educational systems in providing quality education for all learners, enabling them to lead productive and fulfilling lives in an ever-changing, increasingly connected world. SEDL staff address this mission by conducting applied research studies; developing training materials and other products designed to bridge the gap between research and practice; providing training and technical assistance; and creating and fostering educational networks.

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Texas Computer Education Association (TCEA)

The Texas Computer Education Association is devoted to the effective use of technology in education. Since its organization in 1980, TCEA has actively promoted the use of instructional technology for the improvement of instruction and educator productivity. TCEA's primary focus is on the use of technology by Pre-K through university level educators providing members with state-of-the-art information through state, area, and regional conferences, newsletters, and electronic media. TCEA is a broad based organization dedicated to providing all Texas educators opportunities for professional growth regardless of subjects taught or students served.

Contact: Robert Knight, Executive Secretary
P.O. Box 93353
Lubbock, Tx 79493
1-800-282-TCEA(8232)

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Panel Session (T11A)
Integrating Telecommunications into the K-12 Classroom

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Keywords: teacher training, simulations, real-time writing, collaboration, change

Abstract

Advocates of "on-line literacy" cite the support that classroom telecommunications give to the holistic language movement, to collaborative learning and team problem solving, and to providing real issues and real problems with a real audience in real time.

Telecommunications technology, when integrated into the classroom, becomes the unwitting catalyst for restructuring the way we teach and learn. It starts with introducing teachers to the Internet and training them to drive those highways to the classroom of the world!

The computer/modem technology provides an exciting and inexpensive entry into "contextual" learning, expanding the communication contexts of a real audience, real issues, and real problems in real time to include the transcultural dimension produced by distance. It also supports a team approach to problem solving and collaborative writing as a record of the process.

If it is axiomatic to say that changes will occur only if and when teachers themselves make changes happen, then the training of the teacher in both the theory and the practical (technical) aspects of integrating telecommunications into the curriculum is the critical ingredient in the recipe.

LAN groupware programs, such as ASPECTS, REALTIME WRITER, and SEEN, that feature real-time or bulletin board communication define a new collaborative dynamic for writing at all stages from idea generation to publishing. Students learn from each other how to approach writing and thinking problems while they are involved in the meaning, making process and are experiencing the problems. This local area network experience develops in the students the new skills demanded by telecommunications, where words alone, unaided by body language and tone of voice, carry the message.

An emerging host of exceptional educational programs, simulations, science projects, poetry contests, and the like endows the Internet with a rich harvest of inexpensive (some free!) activities easily adapted to the K-12 curricula. (Academy One on the Freenets, AT&T's Learning Circles, FrEdMail's SCHLnet, National Geographic's Kidsnet, Nycenet's Electronic Partners, University of Maryland's ICONS, to name the most active).

Teacher training and staff development models include off-campus graduate-level courses, Train the Trainer programs, and in-classroom facilitator programs.

Panel Session (T12A)

The Mathematics Learning Forums Project: Telecommunications and Inservice Education

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Keywords: telecommunications, inservice education, mentoring, mathematics

Abstract

The Mathematics Learning Forums project uses telecommunications seminars designed to engage teachers (grades K-8) in reflective and instructive conversations about content, learning, teaching, and assessment issues in mathematics. Employing a combination of computer-based communication, print, and videotape, the Bank Street graduate school will offer 24 different on-line seminars for graduate credit, inservice credit, or personal enrichment.

Creating Effective Designs for Using Telecommunications in Inservice Education

The Mathematics Learning Forums Project, funded by the Annenberg/CPB Math and Science Project, is a collaborative partnership between the Center for Children and Technology, Bank Street College's Mathematics Leadership Program, and PBS LEARNING

LINK. Employing a combination of computer-based communication, print, and videotape, Bank Street's graduate school will offer 24 different on-line seminars that support teachers in implementing aspects of the NCTM Standards. Elementary and middle school math teachers around the country can take these forums for graduate credit, inservice credit, or personal enrichment. Each forum will last six to eight weeks.

In these on-line conversations, faculty guide their teacher-students as they try new activities and techniques in their classes and help one another reflect on the meaning of those experiences. Teachers are provided with print materials and an extensive on-line database of relevant video, print, and software. The database will also contain reflective papers by teachers who have taken forums. As the years go by, each forum will become a repository of information about the experiences and thoughts of teachers.

Each forum begins with the introduction of mathematical ideas, described and illustrated through print and video, and then moves quickly into activities that teachers translate into their own classroom experiences. These experiences in turn spark discussion and reflective writing. Each forum will have its own set of text materials: original sources, references, participant assignments, and (after the forum has been run once) a growing store of participants' essays on their experiences in adapting basic forum ideas and materials to their own classes.

The panel presentation will address the following aspects of the Mathematics Learning Forums Project:

1. The development of effective on-line content. The issues of creating curriculum content for short, effective inservice seminars is an important component of this project. Activities must be designed so that they are flexible and can be adapted to the particular circumstances in which teachers are working. We will discuss the role of video and print-based materials and the process of designing and developing these materials.
2. Facilitating on-line conversation. The issue of how to orchestrate effective on-line conversation is complex, particularly when the participants have not met face to face. We will discuss both the role of the on-line faculty advisor and the structure of the forum activities as key ingredients in facilitating on-line conversations.
3. Building support at the school, district, and state levels. In order for this model of inservice education to work, there must be administrative support at the school, district, and state levels. We will discuss our strategies for developing these different levels of administrative support.

Cluster Session (T13A)

Empowerment and Intergenerational Bilingual Literacy: Parent-Child Partnerships in Long-Distance Networks

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This presentation will describe an effort to foster intergenerational bilingual literacy by setting up technology-mediated partnerships between parents — working with their school-age children — and other parents, over long distances. The ethnic- and linguistic-minority parents who participated in this effort were from San Diego, California, and Denver, Colorado, in the United States and Caguas in Puerto Rico. This partnership between distant parents is part of a larger computer-based communications network of teacher partnerships. The network's name, "De Orilla a Orilla" (Spanish for "From Shore to Shore," is usually shortened to ORILLAS); it was chosen to reflect the reality of collaborations that span oceans and continents.

Since ORILLAS teacher partnerships began in 1985, teachers and students (and, recently, parents) have communicated in, French, Haitian Creole, English, Spanish, various English-based Caribbean Creoles, and American and French Canadian Sign Languages as well as other languages. ORILLAS is multinational, forming partnerships principally between educators in Puerto Rico, Quebec, and the United States but also including teachers in English-speaking Canada, Costa Rica, France, Japan, Mexico, and several French- and English-speaking islands in the South Pacific.

We conducted an informal study on long-distance parent collaborations mediated by technology (based on observations completed over the course of a full academic year, together with interviews of teachers, parents and their children, and numerous videotapes) at an after-school "Parent-Child Computer Course" offered at Sherman School in San Diego, California — one of the ORILLAS sites which formed a parent partnership with similar after-school groups in Denver, Colorado, and Caguas, Puerto Rico. These parents and parent-child dyads planned and implemented a variety of jointly executed, collaborative learning projects involving (1) shared journalism and publishing (including the publication of community newspapers and a bilingual booklet of parent-teacher conference guidelines), (2) comparative research, (including an international collection of articles on self-esteem and technology and comparative community surveys), and (3) traditional folklore compendia (including contributions to an international *refranero* or book of proverbs). To coordinate their collaborative "works in progress," the groups used computer-based electronic mail to stay in frequent contact and to transmit their work.

This partnership of three after-school programs in which parents and their school-age children played the central role in organizing on-line activities exemplifies the potential of computer-based telecommunications to build "learning bridges" across generations, cultures, and borders. We maintain that this approach also holds promise for countries, like many in Latin and Central America, that are in the process of introducing computers into schools and looking for ways to link school-based education with community education. We also believe that the results of our informal investigation of parent partnerships illustrate many of the findings of the more formal studies of teacher collaborations in ORILLAS, with intriguing implications for family literacy programs for minority-language parents and children.

The experience of the Sherman School Parent-Child Computer Class suggests to us that technology-mediated exchanges like ORILLAS can serve as intergenerational learning contexts which make parents partners in the building of their children's literacy and help them to become more active agents in the promotion of their own literacy skills. By sharing their linguistic, literacy, and cross-cultural skills, they are forging tools to empower themselves as they shape their own communities.

Cluster Session (T13B)

Writing the Book on Student Management of a District-Wide Network

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During the 1991-92 school year, the Olympia School District in Washington State created an ambitious technology plan. The plan emphasized creativity, problem posing and solving, reflection on thinking, communicating, organizing, and information use. As in most school districts, implementation of the plan depended on increased allocation of funds for technology.

Two major components of the plan's implementation were networking and student involvement. Five schools were chosen from the district's eighteen buildings to be networked and operational by September 1993. The networking included:

- dedicated 56KB data lines linking school's to each other and to the Internet (more than 400 machines with direct Telnet capabilities and 3,000 students with Internet addresses)
- electronic mail, bulletin boards, conferencing, chatting, and voting on the network

- dial-in facilities for fifty users
- print and file service.

The creation of such a network requires wiring, hubs, routers, bridges, channel banks, modems, transceivers, servers, electronic mail systems, Telnet and FTP software, security, and lots of user training. This was too much work for one or two full-time teachers to pull off. There was no money to hire a full-time network manager. What to do? Who in the district had the expertise and time to devote to developing and implementing and maintaining the network? The district's students seemed the only logical possibility. Many were running their own bulletin boards, accessing the Internet, and taking UNIX and C classes at the local community college.

The plan was to identify a core group of 25 high school students and enroll them in a telecommunications class for the 1993-94 school year. This class would differ from normal high school classes in that

- these students would start coming to "class" in August to ready the network
- the class would not meet at a given period or time; students would be spread out during each period to provide continual network monitoring and training
- no textbook would be used. The students would write a text titled *Student Management of a District-Wide Network*.

The creation of this book is the focus of this paper and the talk at TelEd. A Hyper Card data base stack was created by one of the students to enable class members to record their daily activities. Fields contained on the stack were (1) What did you learn today?, (2) What problems did you encounter and how did you go about solving them?, (3) Whom did you have contact with today (teachers, vendors, others)?, and (4) Other pertinent comments. Student comments were checked and commented on daily by both teachers and class members. Reading other students' comments gave some continuity to the class and allowed class members to find out what their peers had done or were planning.

This stack will provide the basis for the book, which is to be written from March to May of 1994. Students with expertise in an area will write that chapter based on a common format. Chapter topics will include (1) Connecting the Wires, (2) Servers, (3) Electronic Mail, (4) Network Management Software, (5) Security, (6) Training Teachers and Students, (7) Internet Access and Use, and (8) Organizational Needs.

The book will require organization and reflection on the part of its authors as well as serving as a valuable resource both within our district and throughout the country.

Cluster Session (T14A)

Computer Dialogue as a Reflection Aid in the Student Teaching Internship

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Keywords: reflection, dialogue, rural, telecommunications, internship

Abstract

This University of South Dakota project created a model for improving the quality of the student teaching experience in rural America through technology. The objectives were (1) to increase frequency of communication, (2) to expand dialogue through networking, (3) to gather information electronically and provide feedback and reflection for evaluation of interns, and (4) to establish a model for replication in any teacher education program.

Research shows that the student teaching experience is the most important dimension of the teacher preparation program. Observational supervision and giving high-quality, immediate feedback is time-consuming and is often viewed as an additional task to perform, rather than as an opportunity to make a difference in the quality of training. New technologies are now available which have the potential to enhance the supervision, assessment, and evaluation tasks during the student teaching experience.

This project created and demonstrated a model for improving the quality of the student teaching experience in rural America by using technology and partnerships among undergraduate student teachers, field-based supervisors in the public schools, and supervisors from the University of South Dakota. The objectives of this project were (1) to provide opportunities for increased frequency of communication among undergraduate student teachers, field-based supervisors, and university supervisors through telecommunications, (2) to expand the dialogue of all parties involved through networking, (3) to implement a mechanism for gathering additional information and providing feedback for the supervision and evaluation of the student teachers, and (4) to establish a model which could be replicated in any teacher education program. This system included a combination of campus-based seminars, local seminars at the public school sites, and electronic networking using affordable technology. The basic structure was a cluster of three school districts networked with an institution of higher education.

All parties communicated by E-mail using an electronic conferencing system on the USD VAX computer via the Internet. Fifteen student teachers were required to establish communications with their university supervisors at least three times each week. A series of questions were identified for use in the personal assessment of their performances in the classrooms.

As a result of this method of communication, university supervisors were able to provide immediate feedback to the questions and comments submitted, as well as pose questions for the student teachers to consider. Communication was also established with some of the field-based supervisors to assist in monitoring the progress of the student teachers and to provide input for modifying the student teaching internship.

Cluster Session (T15A)
Satellite Data Transmission to Enhance Distance Learning

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Keywords: distance education, data transmission, satellite learning

Abstract

Providing accessible programming to typically underserved students throughout the Pacific Northwest is the challenge addressed by Educational Service District 101's Satellite Telecommunications Educational Programming (STEP). As part of a federal Star Schools grant, STEP has provided over 500 school sites with the ability to access educational television programming as well as equipment to receive data transmitted to students thousands of miles away in a timely manner.

Background

The intended purpose of the federal Star Schools program is to provide equity of educational access in science and mathematics to underserved student populations. Satellite Telecommunications Educational Programming (STEP) provides such access throughout the Pacific Northwest, with Educational Service District 101 in Spokane, Washington, as its hub. In addition to three foreign languages, Advanced Senior English and enrichment programming offered by STEP, the Star Schools program is addressing the needs of students in remote rural sites and students who may be at risk for school failure in science and mathematics.

Evaluating student performance of academic tasks in a timely manner has been recognized by learning theorists to be critical to all aspects of content retention. Increasing automaticity as well as diagnosing misunderstandings are critical components of effective teaching. Often, these aspects of the instructional process is missing when subject-matter delivery is conducted via television. As needs arise for smaller and more remote schools to tap into distance programs, the challenge remains to assess continuing student success and the factors contributing to that success (Willis 1992). The system described in this paper should reinforce concepts offered by current learning theory which emphasize immediacy of feedback, student control over the learning situation, and teacher ability to diagnose student thought processes.

A unique feature of this Star School grant is two-way data transmission, allowing for 48-hour turn around time on homework assignments and tests. Traditional transmission of student materials via mail delivery is often slow and expensive, according to *Linking for learning: A new course for education* (1989).

Data Transmission System

Phase 1: Studio-to-school transmission

The model of data transmission used in this project begins with the teacher developing materials (such as a test) using a provided computer application, such as Clarisworks. The document is managed by a file server (in this case, a Mac fx) and sent to a Syncsatellite router which modifies the digital signal of the file server to an analog signal and sends it to the satellite transmitter. The data stream is then transmitted 23,000 miles above the Earth along with the video and audio signal from the on-air course being broadcast.

At the school site, the satellite receiver, as well as receiving the video and audio signal from the studio site in Spokane, receives the analog data stream and routes it to the Syncsatellite device at the school. Once the data are reconverted to a digital signal, the school site coordinator is able to pull them from the Macintosh computer, print the document, and distribute it to students in the class.

Phase 2: School-to-studio transmission

Students at the school site may then modify the document (take a test or complete an assignment, for example). The document is then scanned by the classroom coordinator and sent via modem back to the studio mail server in Spokane. The studio grader then retrieves the document, using standard software, and corrects the student work.

Phase 3: Studio-to-school transmission

Once the student work is corrected, the altered document is then compressed. It may be held on a file server until it is transmitted back to the school site. When the file is ready to be transmitted, it is pulled from the file server using a Macintosh publisher and routed once more to the Syncsatellite device. The digitized signal is again converted to an analog signal and transmitted via satellite to the school.

Summary

Transmission technologies for learning at a distance are expanding at a rate that frequently exceeds educational access capabilities. Technologies that enhance what we know about teaching and learning are coming to the fore as educational communities continue to demand access to them. Data transmission, digital compression, and learning at a distance are becoming an integral part of the way educators do business.

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Cluster Session (T16A)
Satellite Education Networks

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Keywords: education networks, satellites, video transmission, distance learning

Abstract

Satellite Education Networks focuses on networks used to deliver a curriculum of regular instruction to children in schools; to students at universities, at colleges, and in the workplace; and to other audiences with specialized requirements in education. Sixty-nine networks consume a tremendous amount of transmission capacity to reach students in metropolitan and remote physical areas with content that ranges from primary school subjects to advanced technical studies.

As modern society struggles to meet the educational demands of its people, the use of satellite-distributed instruction is increasing in the United States and in countries around the world. The applications and benefits of using satellite technology for educational purposes are many, and schools and educators are finding more innovative uses all the time. In response to the increasing use and interest in satellite distance education, KJH Communications recently completed a comprehensive study on these networks. The report, *Worldwide Business Television Networks: The Education Networks*, is one part of three pieces of research on business television networks around the world.

The Networks

The KJH Communications study defines satellite-based education networks as those that deliver regular programs of instruction, consisting of six or more broadcasts, in a prescribed curriculum to students in public or private schools, colleges, universities, technical institutes, and the workplace. Worldwide, there were 69 such networks at year-end 1991. Sixty-two of the 69 networks reside in North America: 57 in the United States, 4 in Canada, and 1 in Mexico. The remaining 7 networks are in Australia (1), the Netherlands (1), the United Kingdom (2), and Japan (3).

In North America, college and university networks account for about 50 percent of all networks. Thirty-seven percent of networks service children in grades K-12 and 13 percent serve other audiences that receive instruction or in-service training in an educational environment.

Downlinks

While the North American education networks report a total of 15,708 downlink sites, it is important to note that many of these sites receive programming from multiple sources, including other education networks, program networks, even commercial television networks. Fewer than half of these downlinks were installed primarily to receive programming from just one network. With adjustments made for this great overlap, KJH Communications has calculated the total number of downlinks attributable to the education market at 9,443 installations.

Programs

College and university networks produce a wide range of programming, from course work for degree programs in business, engineering, education, nursing, and social sciences to shows on the arts. The K-12 schools use the networks most frequently for programs in math, science, and foreign language. Programs aimed at "other" audiences include curriculum such as postgraduate professional credit or non-credit courses, enrichment classes, or in-service training for teachers.

All networks use some form of interaction between the origination site and the remote students. Besides telephone, which is used by all networks, facsimile, computer conferencing, and data response systems are used.

Transmission

More than 23 different satellites are used for distance education purposes. Though most corporate-owned networks are scrambled for security, almost all education network programs are broadcast in the clear. Scrambling equipment is viewed as cost-prohibitive and not conducive to the extensive sharing of programming that occurs in the educational environment.

Digital compression, however, which permits the use of multiple channels on a single transponder, is causing concerns in the educational arena. The 42-member National Technological University (NTU) moved to a digital compression system manufactured by CLI in early 1992, and in late 1992 PBS announced plans to install a digital compression system manufactured by General Instrument. There is no industry standard for digital broadcast compression systems. This means that networks that formerly received "in the clear" analog programming now have to install the same digital equipment used by the program supplier. Costs of the new equipment and the possible development of a de facto standard are topics of great concern to those who operate education networks. On the plus side, the new digital transmission format allows for multiple channels of programming on a transponder and promises to reduce the cost of satellite transmission.

Summary

Although educational networks cite funding as their number one challenge, KJH Communications believes that satellite-delivered education and training will continue to play an important part in many educational jurisdictions. New networks will come on-line and the numbers of receiver sites will continue to grow. With some of the larger networks moving to compressed digital technology, KJH Communications believes that by 1995 a substantial amount of educational programming will be broadcast in digital format. For most educational institutions, networks were formed because satellite-delivered educational programming is simply the most efficient and economical way to provide students access to courses of study that would otherwise be unavailable to them. And in this world of educational challenges, creative solutions are absolutely imperative.

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Cluster Session (T16B)

Delivering Faculty Development through Satellite Teleconferencing

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Keywords: satellite, teleconferencing, faculty, training

Abstract

STARLINK is a satellite-based training network that services Texas and national audiences. As a cooperative enterprise among Texas community and technical colleges, STARLINK maximizes the use of existing telecommunications systems to serve higher education, state agencies, and other public entities.

State of Texas Academic Resource Link

A satellite-based teleconference training network is a source of production and distribution of programming to diverse and geographically scattered audiences. Such a network offers a new avenue for customized, quick-response training without the cost of travel to a central location.

STARLINK is such a satellite-based network, and it services Texas and national audiences. As a cooperative enterprise among Texas community and technical colleges, STARLINK maximizes the use of existing telecommunications systems to serve higher education, state agencies, and other public entities.

The network is currently made up of the 73 community and technical college campuses using one-way video and two-way audio to bring together national experts and college educators to discuss critical educational issues.

The network was established in 1989 with funding from a federal Carl Perkins Vocational Technical Grant. In 1991 it received additional funding from the State of Texas through 1993.

STARLINK is unique in several ways. First, it is cooperatively managed by two geographically distant institutions: Austin Community College in Austin, Texas, and the Dallas County Community College District in Dallas, Texas.

Second, the network owns no hardware; the members use their own downlink equipment to receive programming, and production facilities either are provided by member institutions or are commercially rented. This allows us to concentrate on training, program development, and delivery.

Third, the network is governed by a grass-roots, bottom-up management structure. Each two-year post-secondary institution has a STARLINK liaison who serves on one of eight regional committees. These liaisons maintain contact with the faculty and receive recommendations from them for teleconference programming. The chairperson of each regional committee serves on the statewide STARLINK advisory committee, which provides guidance to the two network directors, who produce the programming and handle daily operations.

In its four years of operation, STARLINK has

1. produced and distributed 34 professional development teleconferences to college faculty and administrators and community leaders

2. served over 16,000 participants in Texas and thousands more nationally with these teleconferences

3. worked with state agencies and professional groups to deliver customized training. Examples of organizations served are

    - Department of Human Resources
    - Department of Mental Health and Mental Retardation
    - Internal Revenue Service
    - Texas Optometrists

The satellite distance learning technology that has been successfully demonstrated by this network opens new approaches to adult learning and training methodologies. STARLINK offers new cost-effective and dynamic learning ties to non-educational organizations, as well as to higher education. STARLINK brings innovative ideas, and cutting-edge experience to the state of Texas. This training multiplies as teachers or trainers apply it in the classroom to tomorrow's workforce. Faculty are given the tools to ignite students. Shared with business and professional organizations, the network brings new information for development and career enhancement. The network offers flexibility and a wide range of programming.

Cluster Session (T17A)

Internet and Curriculum Delivery: Training of Teachers and Administrators

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Keywords: curriculum, delivery, faculty, administrators, training

Abstract

Technology is changing at a very fast pace and we must prepare teachers, administrators, and students for the type of society they will encounter. One of the critical factors for a successful transition to technology is teachers and administrators who are confident in the application of technology for everyday classroom situations. Staff development is a key ingredient for successful implementation of new technology in instruction. It must be comprehensive and continuing (Morton, C. & Mojkowski, C. 1991). Teachers as well as administrators and coordinators must be involved in this process because of the curriculum changes needed (Morton, C. & Mojkowski, C. 1991). Quality staff development also involves designing and planning for network implementation (Kurshan, B., 1990).

To ensure the success of networking in education, it is necessary to solve access problems to define the infrastructure for network use and for locating information about networks as well as finding good information to place on the networks (Kurshan, B., 1990). An issue related to the use of the networks, as stated by O.R. Bunch (1992) in the final report of SNET, is limited access to students because of the lack of dedicated telephone lines and modems.

This paper will discuss the uses of technology, specifically the use of Internet as a possible vehicle for the delivery of instruction as a distance learning mode. Different protocols will be discussed to provide the reader with an understanding of electronic mail. Examples of SMTP, Telnet, and FTP will be presented. The use of electronic mail has proliferated enormously in recent years. Although there have been some concerted efforts to use a variety of networks for education, very little has been done to take advantage of Internet as a medium for delivery of instruction. Faculty at the School of Education at California State University, Fresno, and the College of Education at Louisiana State University are exploring the possibilities of using networks such as Internet for the delivery of curriculum across distance.

Limitations

There are some problems which require attention in order to fully develop Internet into a tool for the delivery of instruction. An important limitation is the fact that Internet is relatively new. Consequently information related to Internet lags behind the technology. Avenues to information regarding computer networks nationwide are not clearly identified. Part of the problem may be solved with additional professional training of teachers and administrators, including information about the many currently available resources of Internet. However, the research on which this paper is based had certain constraints:

1. The study was limited to K-12 public schools located in northeast Louisiana.
2. The study was limited to its application of Internet as a world wide computer network serving northeast Louisiana.
3. The time frame for the experimental portion of the study was limited to two three-hour sessions and one four-hour session for every group of principals and teachers selected.
4. Participation in the experiment was limited to those principals and teachers who had been recommended and demonstrated interest in the use of computers.
5. Information is lagging behind the technology.
6. Information regarding computer networks nationwide is not clearly identified.

Assumptions

1. The major problems found in other studies of the implementation of networks will be similar to those in Louisiana.
2. The telecommunications training that teachers need in Louisiana will be basically the same as in other states undergoing similar development.

3. Many of the existing resources, such as hardware, software, and LAN's, are interconnected into this specific Internet, established for public use and available to schools.
4. The principals and teachers in northeast Louisiana were objective and truthful in their evaluation of Internet.
5. The chosen criterion measure was valid and reliable for the study.
6. The time-frame for the experimental portion of the study was sufficient.
7. Financial support for implementation of Internet in public schools is available.
8. The instructional package used in the experiment was adequate to meet the objectives of the study.
9. Curricular content will change as a result of acceptance of the use of Internet in the public schools of northeast Louisiana.
10. The subjects chosen for the experimental pretest/posttest control group design are knowledgeable about the use of computers and computer software for improving academic performance in the classroom.

The Theoretical Model

The theoretical model describes several interrelated steps that must be completed before sufficient knowledge is gained about the applications of Internet in Louisiana. Figure 1 describes seven steps that must be completed in the appropriate order.

Step 1. This step was developed through a review of literature and also from a variety of experiences in LAN applied to education in different parts of the United States. Identified problems which are common in networking attempts are considered constants. These constants build up barriers that require attention for the implementation of Internet in the public schools of Louisiana.

Step 2. This step refers to basic training considered necessary for educators to be able to use Internet efficiently and effectively in the classroom. A training package was developed by the researcher for this purpose.

Step 3. To develop this step it was necessary to contact different networks and backbones and list what is available for the classroom in public schools.

Step 4. Once the previous step was completed, it was necessary to establish which of the application programs were suitable for the State of Louisiana and then test them to find out if they were functional.

Step 5. The experimental part of the study was carried out in 16 parishes in northeast Louisiana. The study involved 7 superintendents from school districts in these parishes, 37 principals selected at random from the list provided by the superintendents, and 45 teachers selected from a list provided by the principals, who were then randomly assigned to participate in either the treatment or control group.

Step 6. Once the experimental part was completed, it was then possible to establish the feasibility of implementing Internet in public schools in northeast Louisiana.

Step 7. If Internet could be shown to be feasible, then educational curriculum planners in northeast Louisiana could begin the task of incorporating the new knowledge into the curricula of the schools.

Figure 1

Significance of the Study

This study is most important for what it can contribute in determining the feasibility of implementing Internet in northeast Louisiana schools by(1) making it possible to foresee some of the problems in the process and, therefore, some possible solutions, (2) establishing guidelines for training teachers to use Internet effectively and efficiently, (3) and collecting an inventory of software applications available for everyday classroom needs which will enhance the curricula for the schools of northeast Louisiana. Replication of this study is expected have similar results in the California State University, Fresno, service area in the Central San Joaquin Valley in California.

Review of Internet Current Services and Status

The most commonly used services of Internet are electronic mail, file transfer, and remote login (NSFNET, 1992). Information about these services is provided below.

Electronic Mail

Electronic mail is probably the most common and widespread of these services because it is often the only way to exchange information between Internet and networks that do not use Internet protocols (NSFNET, 1992). Different computers use different software for electronic mail, and different software uses different commands (NSFNET, 1992).

File Transfer Protocol

The FTP is the Internet standard protocol for moving files from one computer to another and it is available on machines at sites across Internet (NSFNET, 1992). It can be invoked to copy files in different formats, such as software, documents, maps, graphics. (NSFNET, 1992).

Remote Login

The Internet standard protocol for remote terminal connection service or remote login is the program TELNET, which allows a computer user at one site to work on a computer at another site (NSFNET, l992). This program requires Internet access, which means users must be on a TCP/IP network that gateways to Internet (DDN NIC, 1991). It actually exposes users to the commands and programs of the remote host (NSFNET, 1992).

Other Internet Services

Resources available on Internet include computing centers, on-line library catalogs, data archives, software and mailing list archives, and on-line databases that contain basic contact information about network users (NSFNET, 1992).

Bracey was cited by ED 331493 (19**) as stating that research lagged far behind, even though computer hardware changed and matured, software became more sophisticated, and teachers began to integrate technology into the classroom.

Presently, there are no published studies that indicate the implementation of Internet for use in kindergarten to twelfth grade. Thus the review of literature will concentrate on smaller communication networks, like Local Area Networks (LANs) and Wide Area Networks (WANs), which have been used for networking schools at different grade levels in a variety of locations.

Networking and Telecommunications

According to Clark, Kurshan, and Yoder (1989), the available modes of communication shaped the world of ancient man just as they continue to shape our society today. The newest form of communication affecting our technically advanced society is telecommunications, the electronic exchange of information across the globe (Clark, C., Kurshan, B., & Yoder, S., 1989).

Technology is in a state of constant change. Computer networking is opening new avenues for education in the classroom. Education is being supplemented and revitalized through the use of networking technology (Kurshan, B., 1991). Schools and students all over the world are linking together to share information and learning experiences (Kurshan, B., 1991). The classroom is no longer bound by its physical walls (Lehman, J. D., Campbell, J. P., Halla, M., & Lehman, C. B., 1992; Morton, C., & Mojkowski, C., 1991).

Networking offers several important benefits to educators: resource sharing, resource management, faster access to more accurate information, and less paperwork (Bishop, A. P., 1990; Kinnaman, D. E., 1991). The most important benefit is the opportunity it offers for interactive collaboration and file exchange (Kinnaman, D. E., 1991). Networking gives instant access to virtually any information source anywhere in the world (Kinnaman, D. E., 1991).

According to Halla (1990), WANs have demonstrated their value to business, industry, and institutions of education. Instant access to distributed data, transfer of E-mail and files, and access to computer systems around the world have significantly increased the value of workstations that are a part of the WAN (Halla, M., 1990).

Use of networks can create new groups and new forms of social interaction, thus reducing the isolation that many teachers experience (Halla, M., Perceival, B., & Snyder, M., 1989; Halla, M., 1990). Computer networking allows teachers to reach beyond their classroom (Schuckel, K., 1990; Lehman, J. D., Campbell, J. P., Halla, M., & Lehman, C. B., 1992). Teachers can share ideas, successes, and concerns with colleagues across the state, nation, or world. They can seek advice from one another and from experts (Halla, M., Perceival, B., & Snyder, M., 1989).

The emergence of computer networks is providing new opportunities for education (Lehman, J. D., Campbell, J. P., Halla, M., & Lehman, C. B., 1992). Teachers can share better ways to instruct students (Maxwell, S., 1991) by bringing resources into the classroom that in the past were beyond it (Lehman, J. D., Campbell, J. P., Halla, M., & Lehman, C. B., 1992). It is possible to bring the global village into the classroom for the benefit of all (Lehman, J. D., Campbell, J. P., Halla, M., & Lehman, C. B., 1992).

The computer is a tool for the teachers as well as students (Maxwell, S., 1991). Teachers and students can use E-mail to communicate with others across the state, nation, and world (Lehman, J. D., Campbell, J. P., Halla, M., & Lehman, C. B., 1992). Computer telecommunications offer means of sharing resources and reducing isolation (Halla, M., 1990; Stout, C., 1991). Teachers are now readily able to arrange for their students to interact with classes around the world, investigate remote sources of information, and facilitate the process of democratization as groups share information (Schrum, 1991). The sharing of experimental data gives the students the opportunity to consider problems beyond their local area (Morton, C., & Mojkowski, C., 1991; Lehman, J. D., Campbell, J. P., Halla, M., & Lehman, C. B., 1992).

Technology advances so rapidly that schools cannot keep up (New Mexico Education Technology Planning Committee, 1991). Therefore, staff development or training programs for teachers and administrators are critical for effective integration of educational technology (Morgan, A. D., 1991; New Mexico Education Technology Planning Committee, 1991), because (1) abundant technologies have recently become available and staff need to learn how to use these new tools (Morgan, A. D., 1991) and (2) the new technologies were unavailable when most teachers and administrators received their preservice education (Morgan, A.D., 1991). Preservice and inservice education allows teachers to get comfortable using computers for personal and instructional uses (Morgan, A. D., 1991). That competence will then carry over into the classroom. Continuous training is important (Morgan, A. D., 1991).

There has been a growing collaboration between K-12 and higher education in designing, implementing, and maintaining statewide networks (Kurshan, B., 1990). Where WANs or LANs exist, gateways are rapidly being established to international and other state networks (Kurshan, B., 1990) .

According to Morgan (1991), computers are rapidly becoming the most widespread and requested educational technology. Several states have developed and implemented LANs and WANs, some of them with applications for grades K-12 (Morgan, A. D., 1991). Barbara Kurshan, in her study "Statewide Education Networks, Survey Results," found that 32 states have at least one statewide network for distance learning and nearly half of them have more than one (Kurshan, B., 1991). For example , the state of Hawaii has an interactive TV system and a computer-based system; the state of Florida operates two systems, FIRN and SUNSTAR. According to the results of Kurshan's study, of the 41 states that responded to the survey, 21 had plans to upgrade existing statewide networks or to implement new statewide distance learning networks. Many indicated that lack of funding was impeding their progress. Since scientists are conducting long-term research, economic and political decisions are being made and these current issues must be informed so that people can comprehend scientific processes and understandings as they emerge, closer links are needed between the scientific and the educational world than in the past (Hunter, B., 1991). This is one of the reasons that it is so important for educators, learners, and scientists to be interconnected on the same networks (Hunter, B., 1991).

Student Enrichment among and between Schools

Ten middle schools in Texas revised their seventh-grade computer literacy curriculum to include telecommunications. Teachers and students were actively involved. The coordinators of these programs felt that all students involved in the project were given opportunities to expand problem-solving skills (Stout, C., 1991).

Recently, the final evaluation report of the Louisiana statewide distance learning program was presented to the Bureau of Academic Support, Office of Academic Programs, Louisiana Department of Education. In this report it was stated that 80.7 percent of the students interviewed in 8 of the 44 member parishes stated that they learned more in their telelearning class that they would have in a traditional class (McElveen, L., 1992). Results from this survey also indicated that telelearning encouraged students to participate during on-line class sessions. This also has been demonstrated through the use of E-mail in the writing process and other projects such as on-line bulletin boards.

Past Problems in Implementation of Networks

Very little information has been obtained about barriers or obstacles faced in the implementation of networks or Internet in K-12. Communications technology has began to be integrated into the classroom, but research lags far behind.

Technical and financial problems were mostly cited in the studies reviewed. Examples of these problems included interconnection of mainframes, connections of terminal and minicomputers to mainframes, cost and compatibility of software (Florida Department of Education, 1992; Bunch, O. R., 1992).

Frank South, education consultant of the Nevada Department of Education, stated in a letter addressed to the researcher, that one of the main barriers to implementing a network in education is educator attitude and lack of knowledge as to what networking is and what it can do.

The major problems encountered in implementing technology in school curricula are (1) resistance to change (Morgan, A. D., 1991) and (2) teacher resistance to spending time in training (New Mexico Education Technology Planning Committee, 1991). A. Morgan (1991) concluded that teachers, principals, and other staff are often inspired and motivated by the potential of educational technology applications in reaching learning outcomes.

As far as training is concerned, research studies report the following: Staff development is a key ingredient for the successful implementation of new technology; it must be comprehensive and ongoing. (Morton, C., & Mojkowski, C., 1991). Teachers as well as administrators and coordinators must be involved in this process because of the curriculum changes needed (Morton, C., & Mojkowski, C., 1991). This involves also designing and planning for network implementation (Kurshan, B., 1990). Another barrier clearly stated in the final report of SNET by Bunch (1992) was the limited access by students because of lack of dedicated telephone lines and modems for the use of students. When several staff members assigned research projects, there was a real log jam of students wishing to go online to do research.

To ensure the success of networking in education at all levels, it is necessary to solve problems of access, define the infrastructure for network use, locate information about networks, and find good information to put on networks (Kurshan, B., 1990).

There is very little information about what is happening in other states and about how to connect to these networks. In exploring other network applications, information access and acquisition would become central to the success of the network (Kurshan, B., 1990).

Finally, if without frequent use of networks and software to automate the process, the connect sequence is easily forgotten. It is easy to get stuck in the system and to be frustrated by the differences among the systems. Keeping up with separate identifications, passwords, and login sequences is a problem (Herron, D., undated).

Conclusions

There is a need to develop a plan for the training of superintendents, principals, school administrators, and teachers in the use of telecommunications. Internet as a super network offers distinct advantages for exploring the possibilities of development for curriculum delivery. The experiment conducted in northeast Louisiana demonstrates interest in the utilization of Internet as a delivery vehicle. The replication of the experiment in the California Central Valley should provide additional information about the way school personnel respond to the application of Internet in curricular development. Follow-up studies should be conducted at the national level to explore the potential for the use of Internet for the training of school personnel and curriculum delivery in K-12.

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Cluster Session (T17B)

Teaching K-12 Teachers to Use Internet: What Works

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Keywords: Internet, teacher training, staff development, K-12

Abstract

As Internet has become more accessible to teachers, the demand for training has skyrocketed. This paper describes two training models which have been successful in the collaborative efforts of a school district and a university to bring a large number of K-12 teachers on-line. The first model involves intensive training and orientation. The second model involves shorter sessions which meet weekly or monthly on an on-going basis.

The Context

The Boulder Valley School District in Boulder, Colorado, is collaborating with the University of Colorado at Boulder to give Internet access to faculty, staff, and students throughout the district. The goals of the project involve investigating how the network is used, what is needed in the way of support, and how teaching and learning are affected. The project is funded in part by the National Science Foundation. Thus far, valuable lessons and patterns in staff development have emerged.

The Models

In the Boulder Valley project, our baseline goals in every Internet workshop are to demonstrate the resources of the network and to enable people to begin exploring the network on their own time. The way in which we go about this depends on the audience.

Teachers attending Internet training sessions generally attend for one of four reasons:

(a) to learn more about Internet;
(b) to be able to use Internet at home;
(c) to use Internet as a tool in the classroom;
(d) to get the credit being offered or because someone told them to attend.

We use one of two models in our training: the "power workshop" and the "progressive workshop." The power workshop is more suited for groups a, d, and, to some extent, group b. The progressive workshop is tailored for groups b and c. Both workshops have several things in common. Hands-on work and reflection are a large component. At a minimum we provide one access account for each pair of participants. We always provide participants with thorough documentation and the name and number of a support person.

The power workshop meets for one half to a full day. The participants get hands-on time with gopher, Telnet and E-mail. We touch on NetNews, ListServes, IRC, and FTP. We give a list of resources (books and people) and discuss how to connect to the network from both home and school. This normally necessitates a discussion on buying a modem and strategies for getting access to phone lines in schools. We also discuss classroom applications.

The key to the sucees of this workshop is to provide documentation which is incredibly detailed and thorough — right down to the last <return>! This serves two purposes. First, there will be fewer "how do I?" questions during the hands-on portions of the workshop. Second, if participants feel they have a concise "how-to" document, they are more likely to try the technology at home.

At the conclusion of the workshop, people are almost always overwhelmed, which is the drawback of this type of workshop (albeit a true Internet experience!). However, it is difficult to give a good overview of the network without overwhelming people. Happily, most people are overwhelmed by all the "good stuff," as well as by the potential of the tool and are very satisfied with the workshop experience.

The second training paradigm, the progressive workshop, is spread out over time and gives participants the opportunity to practice new skills. The workshop is largely hands-on and covers Gopher, E-mail, Telnet, searching tools, NetNews, IRC, and FTP. This format allows much more in-depth work on each one of these topics, and participants know they have someone to turn to for guidance and support on an ongoing basis. The workshop also includes conversation and brainstorming on classroom applications.

This workshop can be done in a relatively short period of time (e.g., twice a week for three weeks), or it can be spread out once a month. If the workshop sessions are ongoing, participants can pick and choose which topics they wish to learn more about and can proceed to the next topic when they feel ready. This is an effective means of continuing staff development for large-scale Internet training. Training teachers to use the Internet resources has been an extremely rewarding venture. As a trainer you will enjoy facilitating the use of a tool which excites teachers and opens up whole new worlds of possibilities in the classroom.

Cluster Session (T18A)

Gender Relations and Telecommunications: New Technology, New Hopes?

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Keywords: social studies, simulations, gender, international understanding

Abstract

In this paper the authors examine female participation in a telecommunications simulation on world politics. Through an analysis of field research, it is discovered that because of the organization and content of the simulation, females do not participate as well as do males.

This paper analyzes the role of females in a high school social science simulation called ICONS (International Communications and Negotiations Simulation), in which students become negotiators representing various countries in the resolution of important issues.

It is based on observations of one classroom representing Canada where the issues discussed were: arms control, international economic problems, nuclear proliferation and human rights.

One author of this paper observed the entire simulation. Because of space limitations, we shall describe only the most relevant parts of classroom observations.

The first task of the teacher was to assign roles to students: prime minister, ministers and deputy ministers. While the teacher appointed the PM (a male), he insisted that females take leadership roles as ministers. All girls chose to be deputy ministers.

Throughout the study, it was observed that the prime minister controlled the simulation, with other boys filling the role in his absence. Although female participation was limited, it improved as the simulation progressed, peaking when issues of social justice and reform were discussed. Some females were conspicuous by their complete absence throughout the simulation.

In the analysis of the lack of female participation, two reasons were considered. The first was the organization of the simulation.

Several researchers (Upitis, 1990; Hunter, 1990; Riel, 1987) believe that CMC offers certain advantages over instruction by other means. It makes communication between distant parties possible, its asynchronous aspect allows users to communicate at their own convenience, it provides anonymity while at the same time direct communication between the parties involved, and finally it provides for equity in communication — each party has a node for direct access to the network.

In this simulation, we find that one person — the prime minister — controlled access to the simulation. All messages had to be approved by him, so the agenda was under his control. Second, because females abdicated all other leadership roles, the discussion was mainly dominated by males.

The second reason, and perhaps the more important one, behind the lack of female participation was the subject matter involved. According to several writers (Novogrodsky and Wells, Brandt, and Coulter), the social studies curriculum is often irrelevant to students' everyday lives and is biased in favor of male interests.

In fact, in this simulation two of the four issues discussed by the students are centered around military prowess, another is based on economic policies on trade, and only one is on human rights (and then in the context of apartheid in South Africa). There is little that relates to students' everyday lives, and military and power issues are rather gender-biased.

Brandt believes that this bias begins in university. Even though undergraduate history specialists realize that subjectivity influences the reconstruction of the past, few are even aware of gender bias (p. 9).

It is clear from this paper that if we are to make progress in changing female participation, the mere presence of CMC will not produce solutions. It is the active encouragement of female participation and a reflection of female needs and interests that will bring about any lasting improvement in the inclusion of females on an equitable basis.

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Highlight Session (T11-CA)

Telecommunications, Educational Reform, and What Work Requires of Schools

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Keywords: educational reform, cross-classroom collaboration, telecommunications, networking

Abstract

Cross-classroom collaboration on the AT&T Learning Network prepares today's students for tomorrow's workplace. Working with peers across distances in "Learning Circles" challenges students to think critically about issues that will shape our future. Participating teachers become part of a worldwide dissemination of instructional innovation. This collaborative approach to teaching and learning makes teachers and students the agents, not the objects, of school reform.

Skills Development for the Workplace

What skills will workers of the twenty-first century need? What are the basic competencies that our educational system should focus on to prepare today's students for tomorrow's job market?

The Department of Labor's Commission on Achieving Necessary Skills (SCANS) calls for dramatic educational reform because of the explosive growth of technology and the globalization of commerce. Good jobs will increasingly depend on people who can put knowledge to use and work well in collaborative settings. The commission describes a three-part foundation of skills:

- literacy
- problem solving
- personal skills

and five competencies:

- identify, organize, and allocate resources
- work with others in a reciprocal teaching and learning context
- request, evaluate, interpret, and share information
- develop a systems approach to thinking about issues
- learn to use the appropriate technology for different tasks

that will provide students with the workplace "know-how" that will be needed in the next century.

The collaboration between a communication service and educators has resulted in an educational program called the AT&T Learning Network. This service provides a strategy for helping both students and teachers acquire the competencies and skills that the Commission of Labor has described as essential outcomes of the educational system.

Students working in Learning Circles (cross-classroom teams linked by telecomputing) are developing these important skills.

The AT&T Learning Network

The AT&T Learning Network has been designed by experts in education and group communication to promote these skills and competencies. The basic *literacy skills* are strengthened through the extensive reading and writing that takes place as students exchange their ideas through electronic messages. *Thinking skills* are critical in the design of projects and the evaluation and presentation of them. Participating in Learning Circles — sharing their cultures, their histories, and themselves — helps students to develop the personal qualities of self-esteem, individual responsibility, and respect for others.

Building on these strengths, the AT&T Learning Network model of team-based collaborative project development integrates teamwork, leadership, and effective use of technology with the ability to manage time resources and information. The jobs of tomorrow will require the ability to work with many people from different cultures and different geographic regions. Teachers and students using telecommunications to work together successfully today are already demonstrating the skills of tomorrow. The AT&T Learning Network strives to connect AT&T's expertise in global communication with the educational expertise of the classroom teacher to create a unified tool that is both powerful and fun.

Educational Benefits of the AT&T Learning Network

Teachers on the Learning Network completed a survey regarding the learning outcomes for students. They report student gains in the skills listed in the SCANS report. Teachers were asked to evaluate increases in student skills on a 5-point scale, with 5 representing the greatest gain. The high scores overall indicate that teachers see strong gains for their students (see Table below). The two items with the highest score were "Developed ability to work in a team" and "Promoted collaborative learning skills." These are important skills identified by the SCANS report that are not addressed in more traditional approaches to education.

Items on Teacher Survey	Mean on 5-point scale* (n=110)
Items related to the SCANS Foundational Skills	
Reading and writing skills	4.1
Collaborative learning skills	4.2
Motivation to learn	4.1
Self-esteem and responsibility	4.0
Items related to the SCANS Competencies	
Time and resource management skills	3.7
Ability to work in a team	4.2
Awareness of other cultures	4.0
Appreciation of own culture	3.7
Research and organizational skills	4.0
Knowledge of geography	4.0
Effective use of technology	4.2

* Scale was 1-5, 1 was low and 5 was high

Summary

Telecommunication in Learning Circles changes the dimensions of student learning. It also creates an educational environment for teacher change. Teacher collaboration encourages worldwide dissemination of instructional innovation and facilitates the development of professional networks of resources and ideas. This teamwork among teachers in the service of school reform is one of the most rewarding outcomes of the continuing evolution of the AT&T Learning Network.

Highlight Panel (T11-HO)

Bringing Real Internet Connections to Schools: Report on the National School Network Testbed

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Keywords: Internet, Copernicus, servers, multimedia, video teleconferencing, E-mail, administration

Abstract

The panel addresses development, implementation, training, and research issues raised within the National School Network Testbed, which operates as a national resource in

which schools, school districts, community organizations, state education agencies, technology developers, and industry partners can experiment with applications that bring significant new educational benefits to teachers and students.

Why build a national school network? Our goal is to make available to schools up-to-date information resources, to engage students and teachers in authentic problem-solving, and to support the implementation of advances in pedagogy and educational technology. Network technology will have an enormous multiplier effect on efforts to improve education through school reform. A network can extend, invigorate, and publicize new approaches to education. With support from the National Science Foundation, we are beginning to extend the rapidly developing national information infrastructure to schools.

The Testbed is a microcosm of a national school network bringing together

- project-oriented classroom communities conducting investigations using network resources and access to remote peers
- teachers who are developing their instructional skills through access to communities of peers
- collaborating institutions that are developing projects and supplying support, training, and research on usage
- technology that is providing a uniform infrastructure for projects using electronic mail, multimedia communication, distributed databases, and multi-user simulations.

As a research enterprise, the Testbed is addressing the trade-off between educational value and cost of the technology. Can the technology bring educational benefits sufficient to attract large-scale investment by local, state, and federal agencies, as well as industry? Can it be implemented in a robust, supportable form with low entry-level costs? Can educational requirements influence the design of infrastructure being implemented for industry, defense, and home access applications?

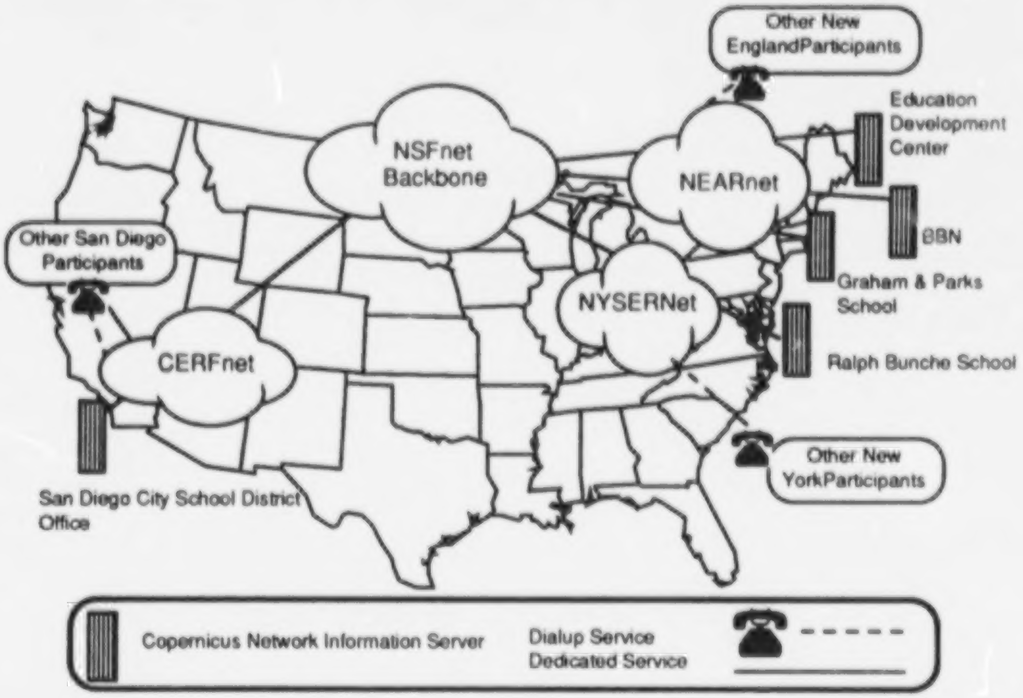
The Current Testbed Network

The Testbed includes national, district-level, and within-school projects. We pay close attention to the organization of learning within the school, where our work includes implementation of the technology-intensive Co-NECT schools, a project funded by the New American Schools Development Corp.

Projects currently under way within the Testbed include:

- **Community of Explorers**: a collaboration of high school science teachers in developing approaches to the use of computer simulations of phenomena such as gravity, relativity, photosynthesis, and population ecology. Distribution of the simulations facilitates teachers, and students, sharing of the output of their investigations.

- **InternNet**: a network of teaching interns and their university-based supervisors that allows rich communication among the interns concerning curriculum development and teaching, especially involving the use of Internet resources
- **MicroMuse**: investigation of the use of multi-user, text-based virtual reality in an informal, after-school setting. Middle school students construct rooms for others to explore.
- **Urban Math Collaboratives**: participation of a national network of math teachers in the Testbed to understand the incremental advantage of real Internet connections over standard dialup bulletin boards
- **Empowering Teachers** and **Alternative Assessment:** two groups of practitioners working with researchers to develop new approaches to teaching and assessment
- **Shadows**: a project to facilitate sense-making discussions within and between elementary classrooms. Participating classrooms collect sun shadows and other data as evidence for their developing theories of the relationship between the earth and sun.


Other New EnglandParticipants
Education Development Center
NSFnet Backbone
NEARnet
BBN
Other San Diego Participants
Graham & Parks School
NYSERNet
CERFnet
Ralph Bunche School
Other New YorkParticipants
San Diego City School District Office
Copernicus Network Information Server
Dialup Service
Dedicated Service

The map shows the Testbed network in operation as of April 1993. Copernicus information servers are operating in two national centers (EDC and BBN), in a school district office (San Diego Unified School District), and in two schools (Graham and Parks Alternative School, Cambridge, and the Ralph Bunche School, New York City). A server is also being installed in the California Department of Education. Over fifty other schools are connecting into the network through dialup connections that give them full access to Internet resources. CERFnet, NYSERNet and NEARnet are regional Internet providers of access to the worldwide network.

Copernicus Technology

We are experimenting with a family of open technologies in the Testbed, not a single proprietary technology. We have labeled this family the "Copernicus" technologies (after an earlier paradigm shift from a belief in the central role of mankind's host planet to an understanding of the distribution of planets as peers in a solar system). In doing so, we move away from the "telecomputing" paradigm that depends on a centralized computing resource or "host" computer to which classroom computers connect as terminals.

The technology at the heart of the Testbed is based on

- **distributed network technology,** used routinely by universities and businesses on the Internet. Distribution, in contrast to centralization, supports local initiative in development of and access to resources.
- **client-server model of computing,** used routinely on personal computers linked on a local network, can be extended to the national network bringing enormous improvement in the ease of use of network services.
- **open software and hardware platforms,** which all developers can use and extend using the public **standards** for network communications (TCP/IP, the Internet protocol suite).

This technology will increase the value of schools' network connections by permitting them direct access to multiple projects and resources and will keep costs manageable by allowing schools to join the network gradually and flexibly.

BBN is working with many of the nation's leading educational software developers to add network services to their applications allowing students and teachers to send and receive lessons, simulations, computer programs, comments, and so on, directly from the application in which they are working, thus creating a rich computing environment that makes full use of network connectivity. The Testbed will also be a resource for developers as a proving ground for new technologies that take advantage of the full network connectivity.

The Testbed Collaborative

Bolt, Beranek and Newman, is a world leader in the development of network technology and in the design, integration, and management of wide area data communications networks. BBN played a leading role in the original Arpanet and the TCP/IP architecture, which is the basis of the current Internet; BBN is centrally involved in development of the future NII. Over the last two decades BBN has also achieved a highly regarded capability in development of and research on educational technologies.

Among the participants and advisors of the Testbed, many of whom met April 25-27, 1993, at the first conference of the National School Network Testbed in Cambridge, are representatives from the American Association of School Administrators; California Department of Education; Center for Technology and Education; CERFnet; Coalition of Essential Schools; Education Development Center; FrEdMail Foundation; Institute for Research on Learning; Massachusetts Corporation for Educational Telecommunications; NYSERNet, Inc.; New York State Education Department; NEARNet; Ontario Institute for Studies in Education; Ralph Bunche School; San Diego Unified School District; TERC; Texas Education Agency; University of California, San Diego; University of California, Davis; University of Illinois; University of New Mexico; Wheeling Jesuit College.

Current funding for the Testbed is provided by

- National Science Foundation for phase 1 of the Testbed (September 1992 to February 1994) and for the Community of Explorers (May 1992- April 1995)
- Many other public and private agencies funding component projects of the Testbed

Additional funding for BBN network-related projects is provided by

- New American Schools Development Corporation for the participation of the Co-NECT schools
- U.S. Department of Education through the Center for Technology in Education for research on the organizational impact of school technology

We plan to scale up the National School Network Testbed by leveraging local- and state-level initiatives so that a wide range of projects can be undertaken among a set of approximately 1,000 schools. The Testbed will operate as a national research and development resource. Reports and recommendations on the basis of concrete experimental evidence will be made widely available on a continuous basis.

Highlight Session (T12)

Picturing the Global Classroom: Technological Forecasting of K-12 Telecomputing Environments

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Keywords: telecomputing, forecasting, global

Abstract

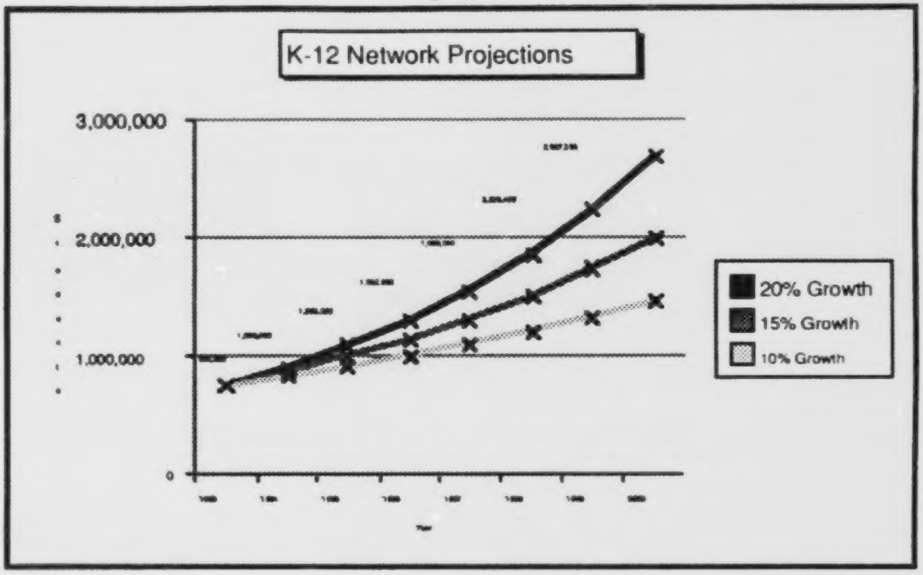
Using the tools of technological forecasting, such as trend extrapolation and leading indicator analysis, school administrators can be well prepared for developments in the emerging global classroom.

Of all the educational technologies taking root in our nation's classrooms, perhaps none is more far reaching than international telecomputing. The advent of K-12 students collaborating globally through electronic computer networks has opened opportunities for group projects and cultural exchanges which are unprecedented in the history of education. But how far will these developments take us? Are we witnessing the emergence of a global classroom, and if so, how are administrators to plan for it? Using the tools of technological forecasting, we can gain an insight into tomorrow's global instructional environments.

To anticipate what telecomputing environments may be like in the year 2000, we employ four forecasting methodologies: (1) driving forces or "trend" analysis, (2) leading indicator analysis, (3) expert opinions, and (4) technological substitution and diffusion models. Using these we are able to gauge both the extent and the impact of new developments in technology. For the world of K-12 telecomputing, these findings are quite significant. For example, by the year 2000 we may expect 2 to 3 million networking students. This is a *conservative* estimate based on 10 percent to 20 percent annual growth rates (Figure 1). If, on the other hand, K-12 networking follows the extraordinary growth rates of 50 percent and 60 percent annually, which have been witnessed recently in higher education, the number of networking K-12 students at the turn of the century will be closer to 20 million. This, however, is an extremely liberal estimate, as it is unlikely that such high growth rates can be maintained. Thus, through trend analysis, we can infer a plausible range.

In addition to quantitative knowledge gained from the above methods, the educational planner will also want to know what impact the technologies will have on pedagogy and administration. He or she may ask, "What changes are in store for my school once it becomes part of the global classroom?" The model of technological diffusion can help provide an answer. It shows that a new technology typically changes the way a task or problem is defined. The computer, for example, is redefining the role of the "textbook." Likewise, the global classroom will have a profound effect on foreign language and social studies programs. Time-tested curricula and instructional methods must be abandoned in face of the reality that students will be communicating directly with peers in numerous nations and of a variety of cultural and lingual backgrounds. In such cases, students are the intellectual resource.

Figure 1



Highlight Session (T13)
Global Schoolhouse: Pilot Phase

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What is the Global Schoolhouse Project?

The Global Schoolhouse Project involved children in California, Virginia, Tennessee, and London. The children have done research on the environment and use video-conferencing over the global Internet computer network to communicate with each other and national and international leaders.

What are the key themes?

The Global Schoolhouse Project is an ongoing activity, not a one-time demonstration. The project uses the Internet infrastructure and provides students with new tools and resources for education.

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The April 28 video conference on the Internet was part of the National Science Foundation's National Science and Technology Week, a week of celebration and activities to promote scientific literacy among children and adults.

The Global Schoolhouse Project is an outstanding example of government, business, and the educational community working together for a common goal. Long-term loans and donations of substantial amounts of equipment and services have made this project a reality.

What are the new techniquest being shown?

The Global Schoolhouse Project demonstrates the use of video-conferencing on personal computers over the Internet. Cornell's CU-SeeMe software allows students to sit down at an Apple Macintosh and work with students in other locations.

In California, project participants are highlighting the use of the Switched Multimegabit Data Service (SMDS), a technology being widely deployed by telephone companies to provide high-speed, low-cost switched data services.

How does the project leverage on an existing network infrastructure?

The Global Schoolhouse Project uses the underlying Internet infrastructure to move information around. Because such an infrastructure is already in place, projects like the Global Schoolhouse can quickly and easily be put together.

The Global Schoolhouse Project demonstrates how networks sponsored by the government, such as the NSFNET, integrate easily and seamlessly with commercial networks such as SprintLink and CERFnet to form a national infrastructure.

What are the implications for education?

Video-conferencing over Internet is a key technology for students to communicate with each other and with educators, policymakers, scientists, and many other resources around the world. The network technology opens up the classroom, allowing students and teachers to take advantage of databases and people previously unavailable to them.

What are the implications for technical policymakers?

The Global Schoolhouse Project demonstrates the use of video over Internet. Increasingly, Internet is being used by many diverse populations as a key part of their personal and professional lives. Projects such as the Global Schoolhouse Project show that the networks are able to provide leading-edge support for multimedia, on-line libraries, and a host of other new applications.

What are the implications for general policymakers?

The Global Schoolhouse Project shows how elementary students can talk to each other and policymakers. Many other populations of users are also on the Internet, including scientists, university students, corporate executives, librarians, and a wide range of other groups. Video-conferencing over computer networks provides a unique opportunity for policy makers to talk to the general public, forming the basis for an Internet Town Hall.

THE GLOBAL SCHOOLHOUSE
"Cutting-edge technology for grass-roots users"

THEN	NOW
1992-93	1993-94
THREE STATES/THREE SCHOOLS California Tennessee Virginia	**ELEVEN STATES/SEVENTEEN SCHOOLS** California Illinois Iowa Missouri Nebraska New York North Carolina Tennessee Utah Vermont Virginia
ONE INTERNATIONAL SITE London, UK	**POTENTIAL INTERNATIONAL SITES** Australia Canada France Germany Japan London, UK New Zealand
ONE MAJOR EVENT Watershed Study	**THREE OR MORE MAJOR EVENTS** On-line Environmental Fair Special Guest Interviews Teacher-Generated Activities
INFORMAL TRAINING Learn As You Do It	**INFORMAL AND FORMAL TRAINING** Original Core 5 Teacher/Principal Teams Side-by-Side Learning Model
ONE CONNECTIVITY OPTION one speed	**MULTIPLE CONNECTIVITY OPTIONS** multiple speeds

telcos	telcos
	cable companies
	wireless
LIMITED INTERNET TOOLS	**ADDITIONAL INTERNET TOOLS**
Basic CU-SeeMe	Improved CU-SeeMe
E-mail	E-mail
Gopher	Gopher
	Mosaic
	The Guide
MACINTOSH PLATFORM ONLY	**MACINTOSH AND PC PLATFORMS**

GSH Overview

The Global Schoolhouse Project, sponsored by the National Science Foundation, provides an environment for students around the world to work and learn together, by communicating with other students, teachers, scientists, and national and international leaders. The technologies involved are desktop video-conferencing, electronic collaboration, and distance learning over the Internet. In the pilot phase of the GSH project, students in fifth through eighth grades in California, Tennessee, Virginia, and London worked together in a study of groundwater pollution and its sources in their communities. They shared their findings by exchanging messages over the Internet and "met" face-to-face once a week using CU-SeeMe video-conferencing software. Students also had an opportunity to present their findings to national leaders in Washington, D.C., in a unique and historic event that was broadcast around the world.

1993-94 GSH Schools

This year we hope to bring aboard at least ten new GSH sites. A combination of the following criteria is being used to identify potential sites: (a) previous successful usage of telecommunications as a classroom tool (ensuring a basic comfort level with the technology); (b) "unbridled enthusiasm" and a great attitude toward innovation; (c) strong administrative support (commitment of a teacher/principal team); (d) existence of a technical support volunteer; (e) willingness to participate in up to two face-to-face trainings during the 1993-94 school year; (f) willingness to train local teachers and mentor; (g) ease of access to an Internet connection; (h) diversity in geographic locations; (i) availability of sponsors.

GSH Training

To fully use this powerful learning tool, two types of training will be provided to teachers and principals: (1) they will receive technical training on using Internet tools in the classroom, and (2) they will learn classroom implementation options (i.e., where to locate equipment, when and how to provide access, how to involve the greatest number of students, etc.). In addition, other related issues, including on-line conduct and integration into existing curriculum, will be discussed.

1993-94 GSH Activities

Schools will be grouped in clusters of four or five according to grade level or topic of study. Teachers will be encouraged to use the GSH activities to enhance lessons that they are already teaching, rather than as add-ons or stand-alone lessons.

Some of the activities planned for this year are as follows: (a) an on-line science/environmental fair. Each participating site will select a student project to share with other schools via CU-SeeMe. A panel of prestigious scientists will interview the students about their projects; (b) a monthly "talk show" where students interview the guest speakers (astronauts, national leaders, scientists, etc.). Students will be given time to research the topic under discussion. They will become familiar with the topic and formulate questions to ask the guest speaker; (c) activities generated by 1993-94 GSH teachers after December training.

Expenses Related to the Project

Most expenses related to this project will be paid for through the GSH proposal, including travel, teacher substitutes, and project instructional supplies. Lead teachers will be paid a modest stipend as compensation for their participation beyond the school day. Every effort will be made to find sponsors for all project-related equipment and services, as we want to demonstrate a strong business and education partnership.

1993-94 Timeline

Our tentative timeline is as follows:

(by 9/13)
- identify new GSH schools (teacher, principal, and technical support person)
- begin sponsor recruitment
- begin Internet connections process

(by 9/20)
- make voice contact with new GSH schools
- follow with official letter inviting participation and explaining our expectations and planned activities

(by 10/1-2)
- Core 5 will meet in NC to develop Phase I activities and training materials further

(by 11/1)
- actively involve sponsors
- connect all new schools and have them join the gsh1-list@cerf.net for collaborative planning and curriculum discussions

(by 12/3-4)

- have GSH teachers and principals meet in San Diego for a two day intensive training and planning (by 1/4/94)
- have spring semester timeline prepared
- have weekly activities under way

GSH Sponsors – The GSH project is a wonderful opportunity for businesses to make a name for themselves in both education and communications history by providing the funding support and services necessary to put these tools in the hands of the classroom teachers. This project is a unique combination of "grass-roots" educators and "cutting edge" technology, and it will have a diverse audience.

The Core 5 – The Core 5 refers to the five original U.S. teachers whose efforts made the concept of the Global Schoolhouse a reality. These teachers will act as mentors and will provide training to the new GSH teachers. The Core 5 teachers are Bob Evridge from Cedar Bluff Middle School, Knoxville, TN; Carla Schutte from Longbranch Elementary School, Arlington, VA; Jackie Lambert from Jefferson JHS, Oceanside, CA; Becki Slowinski from Jefferson JHS, Oceanside, CA; and Yvonne Andres from Jefferson JHS, Oceanside, CA.

GSH Key Contacts – GSH Director of Curriculum, Yvonne Andres and Administrative Assistant Greg Fitzgerald from Global Schoolnet Foundation, will be coordinating teacher training, curriculum development, school and classroom support :: (619)439-0914 or (619)931-5934; andresyv@cerf.net

- GSH Technical Director, George Brett and Administrative Assistant Jane Smith, from CNIDR (Clearinghouse for Networked Information Discovery and Retrieval), will be coordinating technical training and Internet tools assistance :: george.brett@cnidr.org or jane.smith@cndir.org

- Dick Cogger, from Cornell, will be coordinating CU-SeeMe research and development :: R.cogger@cornell.edu

- Susan Estrada, from Aldea Communications, will be our "connections consultant" :: sestrada@aldea.com

Highlight Session (T14)
Telecommunications and Curriculum

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Abstract

How does telecommunications enhance K-12 learning? Join the CoSN Curriculum Committee for a report on K-12 telecommunications and curriculum integration and share your own experiences. Help us shape the future of telecommunications in the K-12 community by helping us to answer questions about guidelines and standards. We will decide together what makes an exemplary project exemplary and what's important about telecommunications in the K-12 curriculum.

The Consortium for School Networking (CoSN) is a nonprofit membership organization at the forefront of the effort to facilitate computer-based communication for staff and students in schools across the country. CoSN's mission is to ensure that schools develop sound networking systems and appropriate curricular applications. Computer networking offers students and teachers the potential of equal access to the information available via Internet. Our goal is for every classroom in the country to have access to these educational resources by the year 2000. Toward that end, CoSN brings together the many groups that are involved in K-12 networking.

CoSN's Curriculum Committee was established in order to determine guidelines for reporting of projects, develop standards of excellence, create an informational database of curricular projects, produce a publication about curricular projects, and disseminate information.

Highlight Session (T15)

Telecommunications in California Teacher Education Programs

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Keywords: telecommunications, teacher education, Internet

Abstract

Telecommunications can provide the basis for a wonderful future or cause the gulfs between various parts of our society to widen. We describe the telecommunications components of the required computer courses and the telecommunications facilities offered at four teacher education programs in California. The conclusions from our examination show great disparity. The likely scenario is that there will be great inequities in the application of technology in education.

Introduction

Telecommunications can provide the basis for a wonderful future or it can cause the gulf between various parts of our society to widen. All children should have a right to a school equipped with multimedia, telecommunications, and teachers versed in the use of these materials. If this is not viewed as a right, the gaps in our social strata will widen. This right may be necessary, but can it be realized?

This question seems out of place among enthusiastic supporters of technology. Those who believe in the future benefits that will be made possible by new technologies will fight to achieve this right. But do all teachers and all teacher education programs hold this belief? In the face of funding shortages, struggles to provide the minimum needed for teaching, and the resignation that captures many teachers after years of hard work with no recognition, it is more likely that acceptance and dissemination of telecommunications will be forced on institutions from the outside (state legislatures or accrediting agencies) than grown from within.

The Possibilities

U.S. school districts spent more money on telecommunications-enabling technology — that is, networks, satellite dishes, and modems — than any other technology ("Update," 1993). A cursory examination of the proceedings from recent conferences demonstrates benefits from this family of technologies in four areas: tools for instruction, curriculum development, infrastructure of the educational system, and the emergence of a new form of communication for education.

Telecommunications technology provides tools for instruction in several subject areas. The obvious beneficiary of technology is mathematics. Edwards (1993) describes several telecommunications-based projects for math. There are applications for telecommunications in writing (Fowler, 1993; Grejda, 1992), science (Southworth and Moore, 1992), and social studies (Oehring, 1992; "Update," 1993).

Curriculum can be enhanced through technology (Drury and Kaufman, 1993) and taken in new directions (Kodet and White, 1993).

The infrastructure for education has been changed by telecommunications. For example, Internet now provides access to the Library of Congress. This means that the database of 26 million materials catalogued and held by the library are accessible at any school that maintains access to Internet (Wilson, 1993). Internet, in fact, provides a wide variety of services (Schaeffer & Olson, 1993), including many databases that can be accessed, queried, and therefore integrated into a plan of instruction (Caputo, 1992). A more widely discussed impact on the infrastructure of education is distance education. There are already examples of distance education providing a benefit in rural areas (Wess, 1993; "Update," 1993). There are even examples of benefits in urban areas, such as the Mass LearnPike (Foote & Lowd, 1993). Whatever one's views of distance education may be, it is clear that telecommunications has already provided an advantage that educators should be concerned about attaining.

Telecommunications provides new forms of communication. It enables all students, such as the students at the Florida School for the Deaf and the Blind ("Update,", 1993), to participate on an equal basis, and to work together without knowledge of one another's abilities, sex, or race (Brehm, 1993).

The benefits from telecommunications are so great that public figures are recognizing and describing a "right" to access Internet. Sobol (1993) states: "I believe Al Gore is right: To accommodate all the uses for which a free and democratic society needs a national electronic network, the network must be built by the federal government and managed for the benefit of all. It is as much a right for a citizen in this country to use such a national network as to breathe the air and walk the public streets."

The Disparities

A commonly recognized problem resulting from using technology in education is that unequal access creates "have" and "have not" groups (Kearsley and Lynch, 1992; Sobol, 1993). Access to technology is likely based upon students' socioeconomic status. Ravitch (1993) advocates that every school be wired for access to forms of educational technology through a mixture of federal, state, and private-sector policies and funds.

Advocacy groups have already formed to protect the interests of K-12 users on Internet, an international network of computer networks. These groups recognize that some schools don't even have sufficient electrical outlets (Hill, 1993).

The Legislation

State legislation in California, Iowa, Maine, South Dakota, and Texas mandates that teacher education programs provide coursework in computing (Tryneski, 1992).

The Case Studies

We interviewed the directors or associate directors of four teacher education programs in Southern California. Program A is at a private, regional, doctorate-granting institution. Program B is at a large, comprehensive state university. Programs C and D are at small, church-related universities that have large adult education programs.

Program A is part of a Center for Educational Studies. The center grants master's and doctorate degrees. This particular program provides fifth-year teacher education for people with a bachelor's degree in some academic discipline.

The course in Program A takes place during the second summer session each year. This makes for an intensive course and limits how much can be done. This institution views students as lifelong learners and expects them to engage in critical thinking. The institution has a constructionist philosophy where people learn at the point of learning. Therefore, the course is taught by current K-12 teachers in their actual computer labs. These labs are extremely wellequipped and have popular software. The requirements for the course are individual, and students do projects that are useful to them. There is a bottom-line set of activities, but the students may go beyond them, depending on their needs.

In our opinion, Program A provides the best telecommunications. This program formed a partnership with a local high school to provide extremely high-quality facilities. The required computer course was offered in the high school computer lab, which allowed teacher education students to see actual examples of a realistic and completely possible technology environment. Facilities were provided that proved a public high school could be on Internet, have multimedia, and provide high-quality learning experiences for students.

The California State University (CSU) system is required by statute to require computing for approval by the credentialing commission. The CSU system, in turn, requires each Cal State to include at least one computing course in the teacher education curriculum. Most of California's teachers, indeed, 10 percent of all teachers in the United States, have attended a Cal State (Kramer, 1991). Program B includes two courses for credit, a two-credit course and a four-credit course with a lab. The class size is limited to 20, which the director expects to be increased. Other courses do not require students to use computers, but papers in all courses must be typed. Therefore, most students use computers for word processing.

The computers available to students who are attempting to complete the state certification requirements for computer expertise include Apple IIEs, Apple IIGS, MAC II, MAC LC. There are also IBM PS2 Model 25s, a MAC SE , and a Quadra. There are lab hours for students to use the computers on their own. The School of Education is responsible for the lab. A faculty member acts as technical coordinator and gets release time. Two of the three labs have telecommunications capability. Program B has a Prodigy account. Instructors generally have students access the campus network to get to Internet.

Program B is an example of an inequitable situation. This program provided the best facilities that it could by itself. Budget problems left it with a site that was, at best, half complete. It was clear that students in this teacher education program would be resigned to accepting "less than the best" once they were in their own classrooms.

Program C uses a lab at an elementary school. The university does have two DOS-based labs, one with a Novell network, but the teacher ed program doesn't use the labs. The teacher ed program was establishing its own lab, but the computers were stolen. There are nine Apple IIs, four Apple IIGSs, and five Macintoshes in the university's learning resource center, which are available for students to use. The lab at the elementary school contains 15 LCII Macs connected to a dot matrix and a laser printer.

The course uses a demonstration method in which the professor does the activity on a computer attached to an overhead projector. Students are given handouts with step-by-step instructions because there is such a wide disparity in their skills. They work at their own speed under supervision. The director of Program C feels that everybody in class is excited and amazed by what they can do, but there is no funding for computing when they get back to their schools.

Program C shows the disparities that exist. Even though the students are using the same model as the successful Program A uses, the lab that they have access to does not provide telecommunications capabilities. It is a smaller school in a school district that is less well off than Program A's district.

Program D's teacher credential course is so packed with information that it becomes a survey course. As a result, the director feels students probably don't get what the state intended them to. The course tries to expose students to all the software available, i.e., drill and practice, simulation, tutorials, and instructional games. The programs are run on two platforms, Apple and Macintosh. The teacher education program is a big user of the university's academic computer center, which has over thirty Macintoshes and at least as many IBMs and some Apple IIEs. Program D also offers courses at off-campus sites, where computer labs are rented from local schools.

Most of the students in Program D are actual teachers. If they are teaching in a technologically covered school, then they know what is out there. Students teach in schools that run the full gambit from two Macintoshes that are locked in the principal's closet to model technology schools.

In addition to the computer course required for the California teacher credential, Program D offers a course in telecommunications. In this class, students access Frednet. There are lectures on, but not hands-on experience, with networks. Program D provides an example where the school is proactive with a course in telecommunications and the intentions are well thought out, but the implementation may vary depending on whether the student takes classes at the campus where the lab is well equipped or at sites where the kinds of computer facilities available are an unknown.

Conclusion

In our paper, we described the telecommunications components of the required computer course and the telecommunications facilities offered by these teacher education programs. The conclusions from our examination show great disparity. The likely scenario is that there will be great inequities in the application of technology in education. From our own experiences at conferences, such as ICTE and NECC, it seems likely that the only factor that has kept such inequities from becoming an overwhelming problem is the enthusiasm for the potential of these technologies by their proponents.

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Panel Session (T21)

Research on Telecommunications and Learning: Theoretical and Methodological Approaches

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Keywords: research, telecommunications, learning, theory, methodologies

Telecommunications technologies offer the possibility of extending and enriching educational experiences in many ways. As a learning environment, tool, resource, or stimulant, telecommunications-mediated learning activities have occurred in pilot and project settings throughout the world and are being considered more and more as appropriate activities for broad-scale educational application. Clearly, in such a rich educational domain, research is important. But how is research being conducted? With what methodologies? Yielding what results? In this panel, multiple perspectives will be offered on the topic of research relating to telecommunications applications in education. What methodologies are most promising for what situations? What contributions can research make? Are there differences in the theoretical approaches to research which are being carried out, or in the expectations for such research? This panel will present a variety of productive theoretical and methodological approaches for research on the educational uses of computer networks. It will build on a discussion which will be carried out via an international computer teleconference before the Tel-Ed '93 conference, stimulated by the Collis and Levin paper in these proceedings.

Paper (T21)

Research on Telecommunications and Learning: An International Perspective

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Abstract

Telecommunications technologies offer the possibility of extending and enriching educational experiences in many ways. As a learning environment, tool, resource, or stimulant, telecommunications-mediated learning activities have occurred in pilot and project settings throughout the world and are being considered more and more as appropriate activities for broad-scale educational application. Clearly, in such a rich educational domain, research is important. But how is research being conducted? With what methodologies? Yielding what results? In this paper, a perspective is offered on *the topic of research relating to telecommunications applications in education. What methodologies are most promising for what situations? What contributions can research make? From an international perspective, are there differences in the approaches to research which are being carried out, or in the expectations for such research? This paper presents a framework for a discussion which shall be carried out via an international computer teleconference which will be presented and extended during a face-to-face panel at Tel-Ed '93.*

Introduction

There are many possibilities for conducting research relative to telecommunications in education. One approach relates to the demarcation of the domain itself. Telecommunications can be primarily used to support one-to-one communication or more complex communication among persons at a distance from one another. Or telecommunications can be used to support cooperative work and learning among persons at a distance, which includes communication support but also adds other dimensions. Telecommunications can be used primarily as a way to find and retrieve particular information, or in a more exploratory way, to support the perusal and evaluation of different information sources. Telecommunications can be used to support the communal development of information collections and of relationships within the information. Or telecommunications can be seen as an object of study in itself, where skill and handling strategies are as relevant a part of the educational experience as were computer-literacy activities a decade earlier. Each of these perspectives suggests a different focus, process, and contribution for research.

And cross-cutting each of the above categories, there are other perspectives for research. A perspective can be based on particular players--the teacher, the learner, the learning group, the moderator, the developer of the software supporting the telecommunications and the subsequent interconnected activities, the developers of learning materials to be involved in telecommunications activities, the administrator making decisions about support and funding for telecommunications at the institutional or system-wide level, the supplier of externally available resources for telecommunications access, or the supplier and maintainer of the technical infrastructure necessary for any telecommunications activity to occur. Again, each focus suggests a different process and output for research activity. Clearly, we need to sharpen our research focus. "Telecommunications and learning" is too broad a term for an operational discussion of either the process or the output of research.

In this paper we suggest a framework for discussing research relating to telecommunications in education in order to stimulate further reflection on methodologies and directions for research in this area. In particular, we consider current methodologies for research relating to telecommunications in education, the sorts of results being obtained from current research, the research directions which might be most promising for emerging situations that include telecommunications use, and a reflection on the contribution of educational research in the short and long term with respect to telecommunications and learning. In each case, the paper offers broadly stated perspectives; over time, discussions emerging from the paper can lead to fuller considerations of each of the general issues.

Research Relating to Telecommunications in Education: Current Methodologies

Recent analyses of the literature relating to telecommunications in secondary education (Collis & De Vries, 1991; Collis, 1992; Wellburn, 1992) have found that the majority of available research studies follow a descriptive, single-case methodology. The researcher, often someone who is involved in the telecommunications project being investigated or who has a particular interest in the area, describes in detail how a particular telecommunications project unfolded in a certain classroom setting. Analysis and discussion tend to focus on problems and organizational challenges faced by the teacher in getting started with the telecommunications learning activity involved, lessons learned from initial exploratory activities, and qualitative evidence of student learning benefits. The output and implications of student activities are often demonstrated by samples of computer-based exchanges and by impressions of student engagement and involvement.

From a methodological perspective, research on telecommunications-related activities takes place neither in controlled settings nor in quasi-experimental settings. Although many telecommunications experiences are occurring in educational settings throughout the world, they are still most frequently embedded within some special project or externally stimulated and supported framework, so that traditional research methodologies such as random sampling or quasi-experimental assignment of classrooms to conditions do not occur. Research generally takes place within the framework of a project whose emphasis is on its own setting up and of providing maximal support to the participants. Research studies do not provide the design of what is happening; such studies may find a way to occur but are not the motivation for the activity. Thus research on telecommunications in education runs into immediate methodological limitations with respect to making causal conclusions — the settings are too atypical, too confounded with situational variables, and have too small a sample of evidence either over settings or over time to permit conclusions about "the effects of telecommunications on learning."

Correlational methodologies also have limited applications in present-day telecommunications-in-education research. Again, the samples of subjects and behaviors are too small and multifaceted to lend themselves to statements about anyything other than serendipitous relationships among telecommunications use and different outcome variables. Too many confounding variables are, and must be, present in any sort of telecommunications use to allow a statistically supported analysis of interrelationships.

Thus the most prevalent methodology is the case study, executed with a wide variety of sophistication relative to methodology. The well-done case study can of course offer rich insights and direction. However, such a methodology involves its own discipline, is grounded in a theoretical position, anticipates generalization at the same time that it supports in-depth local interpretation, and offers support for its validity and reliability of reporting and analysis. It also should identify questions for sharper research and subsequent investigation. It appears, however, that the majority of case-study-type research reports in the literature fall short in meeting these criteria.

Also, in terms of methodologies, certain approaches and questions are rarely found in the research literature relating to telecommunications in education. Research focused on the instrumentation of telecommunications — the software through which the user interacts with his or her own computer and then with other computers, with other persons, or with information — is rarely studied or compared. Research relating to the methodology of estimating or calculating the cost/benefit or even cost/hoped-for benefit (Moonen, 1990) of telecommunications use has yet to emerge. Research directed at the institutional or system administrator relative to different strategies of support of telecommunications implementation also has yet to emerge. Research relating to the organization of on-line information has had little attention, from either cognitive or classroom-management perspectives.

Thus it may be that the following statement is justified: The focuses of research activities relating to telecommunications use in education and the methodologies used to address those focuses are still relatively narrow, and not yet well grounded with respect to validity and generalizability. Such a statement is oversimplistic and contentious; it deserves, however, consideration, debate, and reflection.

What Are the Current Results of Research relating to Telecommunications and Learning?

Much more synthesis needs to be done before this question can be reasonably answered. However, from recent attempts at synthesis, some results seem to emerge emerge consistently (Collis & De Vries, 1991):

- The results of studies of educational uses of telecommunications are often based on the conviction of the teacher that a quality and quantity of communication occurred that would not have emerged in face-to-face environments. However, comparative empirical evidence is not often supplied.
- Students enjoy telecommunications use.
- Predictable difficulties frustrate telecommunications use and limit, at the present time, its spread as a learning environment in schools. Some of these are physical difficulties relative to access to a computer with a modem and telephone connection, others are financial, and still others are related to information about what is available for accessing once on-line and how to accomplish the access.
- After these so-called "first-order" difficulties are resolved, more subtle and important "second-order" difficulties remain. These include teacher training and support strategies, strategies for support and shaping of effective

communication and cooperative work, and strategies for effective and insightful utilization of bodies of on-line information. These strategies, and the creativity and energy needed to put them into operation in existing school settings, present much more formidable barriers to broad-scale telecommunications use in education.

- Little synthesis or cross-fertilization of research and activity as yet occurs; most studies start at an exploratory level, with little practical or theoretical reference to what has already been experienced in other similar projects and studies.

- Those involved in telecommunications projects are positive about their experiences and about the potential of the area. However, their enthusiasm generally does not yet much diffuse to teachers and administrators outside such projects. Also, current projects are strongly influenced by the central persons; the removal of these persons or the cessation of the project framework risks the discontinuation of telecommunications activities.

Are the above generalizations fair for the existing situation with respect to the results of research relating to telecommunications in education? Are there important omissions? To what extent are such generalizations reflective of the current newness of the domain and to what extent do they offer insights and concerns likely to continue after on-line interconnectivity becomes a much more familiar part of daily life and eventually of schools? These are valuable questions for researchers to discuss and reflect upon.

What Are Promising Methodologies for Research?

From a perspective of research focus, certain aspects of the micro, meso, and macro organization of telecommunications use in education have received little systematic study and are now valuable to consider. These include design features of the software aspect of telecommunications use, not only that of the data communications software itself but also that of the environments supporting on-line communication, on-line group work, and on-line information handling to which the user connects. At the mesolevel, much more study needs to be done with respect to effective teacher education and support with respect to the management and educational integration of telecommunications use. At the macrolevel, studies aimed at the educational policymaker to help him or her make decisions about systemwide investment in telecommunications, and for whom and to what extent, are also needed. And at all of these levels, a need exists for strategies for the measurement of the learning efficiency of telecommunications environments and activities. Without better ways of measurement, arguments of improvement and learning value may be unconvincing to those making decisions about support of telecommunications use.

From a methodological perspective, the close analysis of the well-done case study will continue to be an important and realistic methodology for research relating to telecommunications in education. However, the "well-done" admonition could benefit from a reexamination relative to the particular aspects of investigating telecommunications applications in education. Examples of "well-done" case studies in the area should be collected and widely distributed. This process will, of course, stimulate debate about what "well-done" means in this context. Research syntheses should be stimulated, also a process likely to stimulate debate. As much of telecommunications activity involves connection with persons and resources outside of one's own region, comparative analyses of research from different countries and settings should be particularly stimulated, for a better understanding of what one's potential communication and information-exchange partners see as important in the telecommunications experience.

Thus it would seem that the directions of, methodologies for, and cross-fertilization of research relating to telecommunications in education all need expansion. How this might occur is another subject for debate and reflection.

Conclusion: Benefits of Research with Respect to Telecommunications and Learning

Research as disciplined inquiry can offer important insights to those involved with educational applications of telecommunications. For teachers, research can suggest promising applications for the classroom as well as guidelines for implementing telecommunications use to increase the likelihood of occurrence of those promising applications. For teacher educators, research can suggest increasingly effective strategies for improving teacher training relative to telecommunications use, including strategies for effective inservice, for effective ongoing support, and for stimulation of teacher interest and commitment. For developers of learning materials involved in telecommunications activities, research can offer important formative insights for design and development. For administrators and decision makers within an educational system, research can suggest the most promising areas for short-term and long-term support relative to telecommunications, as well as the likely implications of making such support available, from logistic and other planning perspectives. For managers and suppliers of telecommunications services, research could indicate the sorts of problems and the potential of telecommunications use in different kinds of educational settings, as well as suggest directions for cooperating productively with the educational market. For each of these field-based groups, research can help provide evidence for addressing cost-benefit sorts of questions: Is this worth the effort to support? To what extent? With whom? With what? In what ways? And for all these groups that are interested in the effects of new medium on learning and thinking and teaching, telecommunications as a new media offers rich possibilities for research attention. In order to make an appropriate contribution to such a rich and sophisticated domain, research needs similar richness and sophistication. Nurturing the development of a valid and insightful research base and methodology for investigating and improving the impact of telecommunications in education is an important task.

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Panel Session (T22)

Linking Teacher Educators, Education Majors, and Public Schools

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Keywords: teacher education, E-mail, science, mathematics, English

Abstract

This panel features teacher educators engaged in telecommunications projects that assist them in maintaining close connections with their students and public school students and teachers. The projects, which include elementary and secondary school participants, involve such curricular emphases as science, mathematics, and English. The panelists have practical suggestions for achieving successful and valuable telecommunications projects.

Telecommunications in the Syracuse University Professional Development School

Syracuse University's Professional Development School (PDS) is a field experience site for graduate and undergraduate preservice elementary, secondary, and special education teachers. Programs are field-based, placing students in many schools. PDS planning committees initiated projects using preservice students as instructors and accessing the teacher expertise available in schools.

Projects include: using electronic journals in the Writing Programs course offered during elementary education majors' first professional semester; developing materials and activities (shared with Internet) for classes following the progress of Dobbertin's Earth Orbiter; continuing mentoring relationships between students and their teachers into the students' first year of teaching; creating science and social studies units involving pupils with Spacelink and Kidnet; sharing classroom multimedia presentations; and collaborating with local businesses and organizations to enhance PDS experiences.

Doing Science: A School/College Alliance

Doing Science: A School/College Alliance, a federally funded project, uses Email to link teachers and students in rural communities with college science faculty. A team of college and school educators developed a science enrichment program for middle school students which began with guided-discovery experiences and led to student-directed research projects. Experienced teachers and preservice teachers directed the discovery learning activities.

To start, students learn to communicate with college faculty by E-mail as they collect and transmit data on water and air quality. Next, students develop their own research-based projects with the encouragement and support of their mentors. Once students select topics, they access science faculty from more than 20 colleges via E-mail. The faculty serve as resource agents and technical advisors. Student project results are presented locally at Science Exhibition Days and made available globally via Internet.

Using E-mail to Develop Teacher/Learners

This project increases apprentice teachers' problem-solving abilities while decreasing the isolation of student teaching. Besides the difficulty of being less able to have regular contact with their college supervisors, student teachers often view formal observations as threatening and conference with supervisors only after classes are observed and evaluated. Using E-mail to discuss with supervisors and other student teachers, students receive feedback, explore teaching concerns, and provide each other with ideas about effective methodology.

Since students divide their time between middle and high school, they communicate with each other before they swap placements. This dialogue helps each group to provide "expert" advice about student needs at the different levels. They share successful teaching strategies, offer insights on the schools, and become collaborative teacher-learners among themselves. Using E-mail to communicate, students receive more feedback than from formal observations and conferences; they are also initiators of problem-solving discussions.

Learner-Link: Using Telecommunications to Learn and Teach

A rural elementary school expressed interest in establishing dialogue between fourth-grade students and Buffalo State College (SUCB) teacher candidates. SUCB students participated because they had the necessary skills to facilitate networking and were interested in learning about other school districts. SUCB students were paired with elementary students as key-pals.

While preservice teachers in the project were offered broad categories for discussion, elementary students were free to share whatever they wished. Initial discussions focused on sharing common interests as a basis for conversation. Eventually, valuable dialogue emerged, demonstrating the value of having learning communities connected by computer-mediated telecommunications to support educational processes. The project established beginning dialogue between college and elementary students at a remote site.

Cluster Session (T23A)

The World of AGE: A Telecommunications Project

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Keywords: teacher education, telecommunications, networking, computer applications

Abstract

The University Classroom of Tomorrow Project involves developing technological applications for teacher education. Apple Global Education is one of the telecommunication applications we used this year. The World of AGE was one of the projects undertaken by the Apple Global Education group. The project involved approximately 32 schools from 12 countries. Each site was responsible for collecting, processing, and sending its own information. The project included text, graphics, sound, video, and quicktime movies in its presentation.

The University Classroom of Tomorrow Project

The University Classroom of Tomorrow (UCOT) is a teacher education project designed to help upcoming teachers meet the challenges of technology. Funded by grants from the Ohio Board of Regents and The Ohio State University, UCOT has been in existence for five years. We have developed numerous activities for students to become involved with technology. Each of the UCOT students works with us for approximately four years. Kathy Rutkowski, editor of NetTEACH NEWS, writes:

"Teachers like their students need time to 'play' with the technology. It is a new technology and most of the teachers out there teaching have not been exposed to this technology as college students. The younger teachers that are now graduating will be a different mindset and will come into the schools asking for the most advanced work stations and internet connectivity. However, most of our current teaching population has had limited exposure."

Learning is an intense experience. Those who have studied it find that there is a period in which we must "explore (vis play)." Such exploration leads to more disciplined investigations and, with appropriate encouragement and direction, becomes learning. This is a different role for teachers.

AppleLink and Apple Global Education

Each year for the past four years, UCOT has participated in cooperative projects with schools on the AppleLink network known as Apple Global Education. This year's project was designed to collect unique pieces of information about the participating sites. We were interested in gathering information that is not readily available in texts but is commonly known by the population surrounding a particular site. As Dave Allan at Marigold Elementary School in Victoria, B. C. Canada, director of the project, put it, "We are building a new folklore ... or doing our own living archaeology. Without ruling out well-known information, we are looking for those things that are known to the people of the place."

The University Classroom of Tomorrow is similar to many other projects in technology-based education. What makes it different is that it is directed at future teachers. I joined Apple Global Education with the intention of introducing my students to experiences that they could not get any other way. This has become a reality and, indeed, has gone much further. While we participate in several networks in order to do our telecommunications projects, AppleLink is the only one that allows us seamless transmission of text, graphics, digitized sound, and video files among sites. At least that was the case until the introduction of Eudora and Gopher servers to Internet. Internet still seems too forbidding to most teachers. They simply don't have the time or the stamina to overcome the learning curve. In our experience, it has taken at least three quarters or an academic year of constant work and exposure to overcome the anxiety that besets most teacher education candidates. The process seems even more protracted with graduate students who don't have full time to devote to technology learning. This is exactly how the introduction of a project such as the World of AGE plays into the process. It provides a substrate, a vehicle, for students to work in and learn the skills of computing.

What I reported only last year was that my students were using the computer to develop papers for their coursework. This was a justifiable goal for our project in the beginning, I thought, because it broke down the barrier between the student and the computer. We knew that there was more to using the technology than word processing. Ben Shneiderman, of the Department of Computer Science, Human-Computer Interaction Laboratory & Institute for Systems Research at the University of Maryland, wrote: "I have learned many lessons about technology and education in the AT&T Teaching Theater, but my most compelling experience is the acceleration of my transformation as a teacher. ... I see more clearly than before that the path to motivating students is the joy of creation, exploration, and discovery. I see also that these processes are social in nature and that shared experiences in class and through teamwork projects are vital." This is precisely the type of experience, that we attempt to develop in AGE projects. Again, projects such as those that we participate in on AGE are the cornerstones that cause us to probe technology deeper for more applications, more tools. Each of us on AGE could have participated in a project such as Dave Allen has proposed without computers. The time and energy commitment would have been enormous, however. The computer provides quick and efficient feedback that traditional mail services and telephone conversations do not.

The World of AGE Project

We began by building a Hypercard stack of the authors' pictures and short biographies. This is not a trivial exercise. Deciding what to tell about yourself in a small space is a challenge. Producing a "good" digitized image (of yourself) is another difficult task for the beginner. Recording your voice is something new for many of us. This is real-time learning and education. It is demanding, requires sound decision making skills, and requires careful thought. Having completed the task of collecting photos, voice recordings, and biographical information, we next entered it into the Hypercard stack.

Next, we photographed or found pictures of places of interest in our local area. This also created a good deal of discussion. What did Dave mean by this? How were the places to be chosen? We had to decide to make our own rules. We learned later that this was what was expected. At OSU Marion, we have students from several surrounding communities, and so each student picked a place or places that were familiar to them. We learned to digitize photographs and to use Videospigot to capture images from videotape. Next we wrote a short narrative to accompany the photo. Using the Videospigot, we were able to add quick-time movies to some parts of the stack. In some instances, sound was helpful in describing a location. Again, decision making was critical to choosing the material. This information was then sent to Mr. Allan and the students at Marigold to be incorporated into a large Hypercard stack.

We have visions of expanding the stack to include high-resolution images of the locations and the participants, as well as longer descriptions of the places they submit. We now think that the information we have gathered can be an ongoing history of our research project. As new students come into the project, we will simply add their information to the stack.

Summary

In sum, the participants have learned many new technological skills. We all know how to collect and edit sound recordings with the audio Hypercard stack and SoundEdit software. We know how to capture each other in quick-time movies. We have learned to edit the digitized information with Premiere software. We have developed some knowledge of Hypercard and how to incorporate quicktime movies into it. We all collected new information on familiar places to share with everyone.

What we have found in our five years of experience in doing this sort of project is a renewed commitment to and a completely different vision of teaching and learning and different types of commitments from teachers and students. We have come to understand that education is not about books and tests, but about relationships. Both teachers and students developed a new and much more comprehensive vision of the use of technology after participation in such a project.

Biography

Dr. Marvin Bratt, associate professor of education, Ohio State University, will present the paper. Dr. Bratt is the director of the University Classroom of Tomorrow Project, a technology-based teacher education research and development program at Ohio State. He graduated from Purdue University with a doctorate in science education in 1973 and has been at Ohio State since then. Before that, he completed his bachelor's and master's degrees at Indiana State University and taught in the Duneland Public Schools in Chesterton, Indiana, for three and one half years.

Cluster Session (T23B)
The World at Our Fingertips

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Keywords: global communications, classroom project, geography, writing, research

Abstract

Using TENET, students communicated with other students in countries around the world. Students learned about telecommunications and geography, improved their writing skills, made new friends, and became aware of our global society.

Telecommunications Project

We are truly living in a "global society." In order to learn more about the world and its people, students worked on a telecommunication project using TENET, the Texas Education Network, which enabled them to have the "world at our fingertips." Students communicated with other students in foreign countries. Working in cooperative learning groups, each group wrote messages "off-line" and then "up-loaded" the messages to their new "key-pals." Topics of discussion were politics, education, customs, religion, traditions, music, literature, sports, drug use, etc.

Students also prepared a research paper about their country, using a variety of resources. Students wrote the travel boards of their selected countries and requested data. A package containing pictures of the student group, school newspapers, postcards with scenes from Texas, a brochure about our city, and a large magazine (obtained free from the State of Texas) was sent to the foreign students. In return, my students received packages from all over the world containing similar items. Student groups made oral presentations to their classmates detailing interesting facts about their country. Native foods, items from the country, posters, music, pictures, etc. added to the students' presentations. The presentations were videotaped and shared with all the other classes. After this project, students fully realized that the "world is at our fingertips."

Cluster Session (T24B)
Changing Traditional Frameworks: An Australian Teacher's Story

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Keywords: distance education, video-conferencing, educational technology

Abstract

This paper highlights a teacher's experience with changes brought about by incorporating video-conferencing and audio-conferencing into a teaching/learning environment. Ongoing reflections from a teacher who was involved in implementing a move from a traditional tutor-led discussion group to a structured, student-oriented tutorial model are analyzed in terms of imposed change.

Most of Australia's population is located in small pockets near the coast. For educators, and others, a major problem to overcome has been the isolation of of the population groups.

Our external students experience the isolation not only from the university and its resources but also from their peers. Various means and methods have been used to overcome their feelings of isolation. The project under discussion sought to use video-conferencing to solve the problem of feeling cut off from the university community.

Video-conferencing is a relatively new medium in distance education which, to date, does not appear to be used to its full potential as an instructional tool. Despite its promise, however, little is known about the effects of it and other technologies besides print on student learning, or about how to effectively incorporate video and audio conferencing into existing print-based external courses. In this project the tutorial structure involved both internal and external students working with one tutor, simultaneously, from different sites hundreds of kilometers apart. The type of video-conferencing used was two-way video, two-audio using compressed digital transmission over ISDN. Four sites were linked up.

The tutor came to us with no video-conferencing qualifications other than her willingness to be involved in the project. We have all learned on the job. It is difficult to find people with the experience needed to conduct video conferences. There is a need for skills in tutorial, multi-point video-conferencing and audio-conferencing management. For video-conferencing to be used as a communication tool in an educational environment new teaching/learning strategies need to be developed and changes made. Educational change theory maintains that for change to be successful it must take place at three levels: materials, teaching processes, and beliefs. Thus our project aimed for change not only at the technological level but also at the level of instigating interaction between external and internal students, as well as changing students' perception of themselves as learners.

We decided that interactivity at all change levels was the key. We felt if video conferences weren't interactive, students might as well receive a pre-taped video. This emphasis on interactivity necessitated a further change — the tutorial structure. Tutorials had become mini-lectures. The video tutorials gave us the opportunity to devise strategies to encourage students to interact not only with each other but also with the course printed materials. The strategies included "firing line questioning" techniques, debates, role playing, and evaluating statements. These strategies provided maximum interactivity and also lent themselves to the stated aims of the course.

No project is without its share of problems: We experienced problems with timetables, group dynamics, and students' other commitments. The technology is user-friendly and did perform to our expectations. However, students tended to defer to the person operating the video-conferencing equipment rather than to their tutor.

Some students came to the video-conferenced tutorials with fixed ideas about their learning. These ideas included their method of study, traditional assessment, and peer interaction. For these students the changes we tried to implement caused feelings of loss, anxiety, and struggle, even though they had volunteered for the project and they were active rather than passive participants in the change process. For the tutor this was also the case. We were constantly reminded of the concept of "fixity" — the power of the status quo to resist change.

In some ways the success of these video-conferenced tutorials can be measured by the students' request: "Can these please last for two hours instead of one?" Moreover, the strategies we pioneered have been transferred to tutorials in other units.

Cluster Session (T25B)
Conducting Cooperative Research via the Internet

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Abstract

This paper describes the process, issues, and procedures needed to conduct a large-scale cooperative research project via Internet. Project H, as the research effort is labeled, is composed of over fifty researchers participating in a quantitative study of computer-mediated communication. Participants include a diverse representation of researchers from a variety of countries and institutions. The project began over one year ago and is still in progress.

Project H

Traditionally, large-scale research efforts have been difficult to initiate and complete, because of the costs and constraints involved in gathering numerous researchers in one physical location, transporting and assembling equipment and other physical resources, managing and directing the support personnel, and planning the logistics. Thus, such projects typically have been limited to those that could be sponsored by government agencies and large corporations, such as the Los Alamos Project and, more recently, the Super Collider.

Project H is an unprecedented effort to conduct a large-scale cooperative research project without face-to-face contact. Although Internet, and its precursor ARPANET, were established with the intention of facilitating communication and scientific investigation among researchers (Collins, 1993), Project H represents a significant extension of this original intent. Rather than limiting discussion and interaction to dyads of researchers via electronic mail, Project H employs the multiple resources available via Internet, such as file transfer protocol, Telnet, electronic archives, and listservers (Krol, 1992) to allow common communication and shared resources among many participants. In essence, Project H is, as described by participant J. Glickman (communication via Project H discussion list, August 30, 1993), a "virtual research project."

Project H was initiated over a year ago by soliciting participation via a number of research-related discussion groups on Bitnet and Internet. Dr. Fay Sudweeks, from the University of Sydney, and Dr. Sheizaf Rafaeli, from the Hebrew University of Jerusalem, have provided leadership and direction for Project H since its beginning. Their leadership has been supplemented by numerous committees and individual members of Project H. The remainder of this paper will describe the process, issues, and procedures involved in conducting Project H.

The Invitation to Participate, Purpose, and Rationale

Invitations to participate in Project H were placed upon a variety of discussion groups on Bitnet and Internet. Over one hundred persons from fourteen countries indicated an initial interest in participating in Project H, which was described as a large-scale quantitative study of electronic discussion groups. Persons volunteering to participate were asked to submit a short biography, which was placed in an electronic archive accessible to all participants.

The intent of Project H is to sample content from a large number of discussion groups. Specifically, S. Rafaeli and F. Sudweeks (communication via Project H discussion list, January 28, 1993) indicate that analyses are directed to four major elements: the single message, the aggregate thread, the authors, and the lists themselves. The goals of the project include investigating various hypotheses pertaining to computer-mediated communication, collecting data that would describe the nature and state of communication on a large cross-section of discussion groups, producing a database that would be useful for future research, and establishing a procedure and a precedent for conducting a cooperative, multi-person research project via Internet.

To date, numerous studies have examined various aspects of computer-mediated communication, although many of these studies were based on very narrow and selective one-time examination of a single discussion group. Participants in Project H have identified and placed in electronic archives over 230 research references on computer mediated communications. Many of the existing studies are based upon anecdotal information derived from self-reports and are therefore subject to ambiguities associated with measures of questionable validity. To examine the domain of computer mediated discussion more objectively, content sampling and quantitative analysis were selected as preferred methodology for Project H. Since a major strength of Project H was its broad base of participation and available "manpower," it was decided to sample multiple lists on multiple occasions.

Ethical Issues and Copyright

Any research using humans or animals must be concerned with the appropriate treatment of research subjects. Research in the area of computer-mediated communication is no different, but many ethical issues associated with research in this medium are unique and subject to interpretation. Participants in Project H carried on an active discussion of ethical issues. On the basis of these interactions, an initial draft statement of ethical policy was written by a committee of participants and distributed and discussed among members of Project H. Such issues included, but were not limited to, the need for informed consent, identification of authors, citation and quoting of messages, and approval from institutional ethics committees. After additional discussion and consideration, a revised ethics policy was approved and posted to the electronic archive of Project H. Adoption was based upon reaching an apparent consensus among members based upon their comments and stated approval. Such consensus seeking has continued to be characteristic of the decision-making processes within the culture of Project H.

A copyright policy was also proposed and approved by Project H members. This policy was written to address intellectual ownership issues and to explicitly indicate when and under what conditions collected data, coding criteria, and other material would be publicly available.

Sampling

The object of any sampling procedure is to produce a representative group of objects for study so that inferences describing population characteristics will be as accurate as possible. There are a variety of sampling strategies, each of which has particular strengths and weaknesses. A committee of Project H members was established to consider sampling issues, and, after considerable discussion and evaluation of alternatives, the committee recommended a random sampling procedure for list content with stratified selection of list type. Certain lists were excluded, such as announcement lists, very low-volume lists, and foreign-language lists. Stratification was based upon selection from an equal number of lists from Compuserve, Bitnet, and Usenet. From each of the three strata, twenty discussion groups were randomly selected. Additional groups, not to be included in the main analysis, were selected based upon particular interests of Project H members. After each list was selected for inclusion in the sample, 100 messages or three days' worth of messages, whichever was greater, were randomly selected from each list. In addition, 100 messages or three days' worth of messages were pre-processed to provide additional information that would be used in subsequent message precoding. Precoding messages was done to provide identifying information about the list, subject classification, and author. Additional information about each list, such as average number of posting, number of readers, and average length of threads, was also collected when available.

Variable Selection and Coding

On the basis of a non-inclusive list of hypotheses and research questions, a set of relevant variables was identified by Project H members. For each of these variables, a written set of coding (scoring) instructions was prepared. These instructions included examples, a definition, and a scale for quantitatively evaluating each variable. These instructions were compiled into a code book that went through several revisions, eventually resulting in a document that included directions for coding 46 variables. Subsequently, a number of standard data file formats were established, and several coding aides, including a Hypercard stack and a public domain database, were made available to members to assist in automating the coding and storage process.

Reliability and Coding

All meaningful measurement must be based upon reliable data. Once again, a committee of Project H members volunteered to consider reliability issues. After review of accepted reliability procedures, the committee recommended a test – test reliability design. This method was selected because there were no known existing criteria to accept as a standard for training coders. The test – test reliability design required that all messages be evaluated by a minimum of two different raters or coders.

Before the sampled data were actually coded, a trial set of nine messages was provided to each coder, with two coders receiving the same set of nine messages. This trial coding was done to provide a test run of the code book, identify any questions or issues relating to coding of specific variables, provide practice for coders, and check between rater reliability. At this point, 79 persons committed themselves to complete the preliminary coding. Preliminary analysis of the data by S. Rafaeli (N=35) indicated an average agreement percentage among coders of 87 percent, with agreement for most variables exceeding 80 percent. It is expected that reliability of the actual data will be greater than these initial estimates, based upon a larger group of coders who have more experience and knowledge regarding the coding criteria. In order to ensure independent coding by each participant, a series of safeguards and procedures was established and agreed upon by Project H members. No discussion involving questions of how to code a particular variable was permitted on the general Project H list. Several "oracles" (Project H volunteers) were identified to act as consultants to coders who encountered questions regarding coding of variables within their samples. Communication with each oracle was done privately.

Data Collection

The sample data have been broken down into batches of 100 messages. Each batch of messages has been assigned to two different coders, independently. In addition, each coder has been provided with a list of authors for the messages, a code book, and a questionnaire (to be completed after coding). Coders are now in the process of coding their assigned data. It is expected that all coding will be completed by the end of September. After each coder has completed coding their batch of messages, the data will be stored in a data file which will be electronically transferred to a central location where all of the data will be collated. The complete data set will then be made available to Project H members for analysis.

The Face-to Face Meeting

Only a few of the Project H members have met one another in person. While physical characteristics are largely unknown, many members have formed tentative mental models of the personal and psychological characteristics of other members. This is, of course, a result of the frequent virtual interaction among Project H members. At this point, a community has been formed, and many members would like to participate in a face-to-face meeting. The overt purpose of this meeting would be to provide a forum for scholarly presentation of the results of the Project H study. Not coincidentally, it would provide an opportunity for members to "fleshout" their mental models with a physical entity. Such a meeting is now in the planning stages.

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Cluster Session (T25C)

Taking an Electronic Carpet Ride: A Whole New World via Electronic Mail

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Abstract

When Bitnet was introduced into the University of Wisconsin-La Crosse campus five years ago, it got off to a slow start. People had to learn to use it. Documentation had to be developed. Training sessions had to be held. Now that Internet and WiscNet are also available, the main concern is how to bring them into the classroom.

Aside from the usual uses in terms of internal communications, not too many faculty members have devised ways to incorporate these resources into their courses. Over the past year more faculty members have discovered that it can be an effective means for communicating with their students. It can also be a means of encouraging their students to increase and improve their writing skills without their actually being conscious of it and an effective means of getting students to communicate with their peers from other countries. Thus, electronic mail has been an effective venue for an institution's goals of trying to bring together computing and writing and internationalizing the curriculum.

As information technology becomes more commonplace in higher education, faculty members in various fields find themselves relying on available network resources for valuable information in their areas of specialization. There is a wealth of information to be found in the networks for different fields of study. In this paper I will address the various sources of information which the political scientist can rely on and make use of via electronic mail, placing emphasis on what the applications have been to the political science classroom in courses like American National Government, Global Issues, Comparative Politics, Asian Government and Politics, and Women and Politics. I will take a look at what network sources are available, where they can be found, what to do to get to them, how to use them, what sources to make use of in order to obtain maximum information. I will also address the question of how they can be incorporated in various courses and how useful they can be to the individual faculty member who chooses to invest some time in learning about these resources.

Introduction

This paper examines some of the uses of electronic mail for faculty who teach international studies courses. We will describe its use for courses such as Global Issues, Women and Politics, Comparative Politics, and Economic Development. We will focus on some of the advantages and disadvantages of using electronic mail. With the help of end-of-term student evaluations, the success of this class resource can be shown as well as the pitfalls that accompany this nontraditional method of delivering education. We offer suggestions for incorporating electronic mail in other courses through the resources available in "netland" in order to make the computing learning experience more exciting. We include a discussion of Listservs on Bitnet, telnetting into different campus libraries via Internet, and poking into resources such as the Cleveland Freenet for *USA Today* headline news. With these resources on hand for faculty, it is hoped that they can broaden their students' perspectives on various issues whatever their subject matter.

All Those Nets

There are many kinds of network available to an academic. Many states, such as California, Minnesota, and Illinois, have statewide networks connecting their various campuses. The State of Wisconsin has WiscNet, a high-speed computer network that connects the University of Wisconsin System campuses and many of Wisconsin's private academic institutions. WiscNet's purpose is "to advance education, research and public service by assisting in the exchange of information among research and educational institutions by means of high-speed data communication techniques, and to assist those institutions in gaining access to scientific and educational resources." Thus, WiscNet also links the state to regional, national and international computer networks such as Bitnet and Internet.

Bitnet is a network of mini or mainframe computers connecting numerous universities and colleges which allows for mail storage and forwarding capability. Internet is also a collection of networks which uses the TCP/IP protocols for exchanging information. Depending on which network an institution is linked to, one can have access to various Bitnet and Internet listservers.

Listservers are host computer centers which distribute electronic mail and files either by subscription or by single request. There are hundreds of listservers set up for all types of topics that serve as storehouses of information for various topics.

So What Do We Do with All Those Nets

Learning about the wonderful world of networks tends to be overwhelming, as most of our students experience the very first time we introduce it in a course such as a "paperless" Asian Government and Politics. However, it is interesting how some student comments which are made four years after taking such a course reinforce the usefulness of putting outlines and notes in the network.

International electronic mail communication has its positive and negative results. There are students whose positive experiences include continuing friendships with original contacts from other countries as well as students whose experiences ended up in complete frustration. An instructor who tries to include electronic mail in courses, especially on an international level, should be prepared to deal with student frustration. Certain conditions, such as the ability or willingness of individuals on the other side to respond to one's students, will not be within the instructor's control.

It should be recognized that many college students, unlike their elementary and secondary school counterparts, often get turned off by the mere thought of facing a computer. It is paramount that the instructor who is trying to introduce electronic mail should be computer literate, relaxed, and confident about incorporating it in the curriculum. Faculty would be doing a disservice by merely directing their students to the computer center for help when they have problems.

One of the most valuable things about being part of "netland" is that it allows students and faculty to connect with various resources from all over the world. How can one demonstrate the capabilities of the network? Early in the term, usually the second or third week, one can hold a laboratory session to introduce electronic mail and the internet to the classes. Each student must be provided with an account with which the instructor can make available a distribution list for everyone so that from the outset students can send messages to each other. Students can be provided with step-by-step instructions on what to do and what the capabilities of the system are. And during the introductory session students can be allowed to tap into libraries all over the country and all over the world by TELNETting to various sites.

Telnet is a type of program which gives the user the ability to establish a connection with a remote computer connected to Internet, each site having its own set of commands to follow. Experimenting is the only way to learn. Here are a few addresses of services and libraries to try:

1. The Cleveland Freenet which gives USA TODAY headline news:
   TELNET 129.22.8.38.
2. Libraries using their IP(Internet Protocol) numbers:

Marquette University	134.48.20.1
Boston University	128.197.130.200
University of Delaware	128.175.13.6
Dartmouth University	129.170.16.11

3. Other libraries using their domain names:

Cornell University	CORNELL.CIT.CORNELL.EDU
Library of Congress	DRA.COM OR LOCIS.LOC.GOV
University of Notre Dame	IRISHMVS.CC.ND.EDU

Students find that "poking into Internet" can be very intriguing. They find these resources to be valuable because of the information they can access for a variety of classes. Depending on the course, students may also be made to correspond with students from other countries. For example, our students have traded views about "examination hell" with Japanese students, the socioeconomic repercussions of Mount Pinatubo's eruption with workers in the Philippines, as well as views on "relationships" among young adults in various countries.

It is less threatening to students if the computer exercises are started two or three weeks into the term rather than during the first week. In this way, students do not get the impression that the focus of the course is computing; instead they understand that computing via electronic mail is merely a supplementary tool for learning. Students better appreciate the value of what they are learning if they are eased into it, are immersed in it during the entire semester, and are able to discover for themselves the fun inherent in this learning tool. We believe that the instructor must work to sustain student interest throughout the term and should not relegate the learning to just one lab session. It is even possible to encourage students to use electronic mail by providing extra credit to those who obtain the essay-questions portion of exams via electronic mail and who send in their responses via electronic mail as well.

Assistance for this endeavor can come from various sources, foremost of which is the campus academic computing staff, who can provide training and documentation for faculty. Handouts may already exist or be developed for introducing students to the campus system (the VAX in our case) and to electronic mail as well as lists of potential persons to contact, and Telnet addresses for students to try. Having a prepared list of contacts is more effective in encouraging students to use electronic mail than asking them to establish contacts themselves. We have discovered that numerous people in netland are more than willing to help in efforts such as these; the most recent proof of this was the enthusiastic response we received when we issued a call for people willing to correspond with our College for Kids participants. These potential college students were so excited about receiving mail from New Mexico, New York, California, and even Australia.

As a way of practicing, we encourage students to send messages to us and to their classmates throughout the semester. Once they become comfortable with using this facility and are armed with their list of contacts, they are better able to communicate with the rest of the world. And by sending messages to several people in the network, they are assured of at least a response.

It is also helpful to focus student network discussions on specific topics. For example, some of the topics covered in an Asian Politics course were election procedures, veneration of the Japanese emperor, and various holidays. One American student was going through her LSAT (Law School Admissions Test) at the time that she was corresponding with a student from Japan. Since the Japanese student was also going through entrance examinations, they were able to discuss their own versions of "examination hell."

Using Those Listservers

We have also found listservers to be valuable sources of information for students. Through the listserver, they can receive issues of the *China News Digest* that keep them posted of occurrences in China which never make it in the U.S. press. During the 1992 presidential campaign, they could receive information about the Clinton, Bush, and Perot campaigns from network lists dedicated to these candidates. They could also receive details on the candidates' positions on various issues which in turn clearly benefitted the mock debates and mock elections held on campus.

We have encouraged students to use the network to find information that is not readily accessible from the campus libraries. For example, in preparation for the XVII Arrowhead Model UN, student groups had to represent different countries. The group representing Greece could not find much information from internal sources but through a listserver located a collaborator in Greece who was able to provide them with much of the needed information.

Here are a few examples of listserv lists that may be useful for internationally oriented courses:

Net-wide ID	Full address	List title
AJBS-L	AJBS-L@NCSUVM	Association of Japanese Business Studies List
APNET-L	APNET-L@JPNSUT00	Asia Pacific Network
BUDDHIST	BUDDHIST@JPNTOHOK	Forum on Indian and Buddhist Studies
CHINANET	CHINANET@TAMVM1	CHINANET: Networking In China
PAKISTAN	PAKISTAN@ASUACAD	Pakistan News Service
SEANET-L	SEANET-L@NUSVM	Southeast Asian Studies List
AFROAM-L	AFROAM-L@TEMPLEVM	African American issues in higher education
CANALC-D	CANALC-D@YORKVM1	Latin American and Caribbean Digest from Canada
EC	EC@INDYCMS	European Community
HUNGARY	HUNGARY@UCSBVM	Hungarian Discussion List
POLI-SCI	POLI-SCI@RUTVM1	Political Science Digest
UN	UN@INDYCMS	United Nations
WMST-L	WMST-L@UMDD	Women's Studies List

As one can see from this abbreviated list, there are discussion lists for many kinds of topics. One can get a complete list of listservers through the BITNIC.BITNET server by sending an electronic mail message addressed to LISTSERV@BITNIC.BITNET. In the body of the message, type the following command: SEND LIST GLOBAL. Be prepared to receive a huge text file covering the latest listing of discussion groups available via this Bitnet site.

To find out more about the political and economic changes going on in developing countries, one can subscribe to AMNESTY and ECONOMY. Some lists may cover specific countries in Asia and other parts of the world while others provide up-to-date news. During the Soviet coup, one colleague from the University of Wisconsin-Eau Claire monitored the evolving situation through the Baltic States list.

When major issues are brought to the fore, such as when the Clarence Thomas - Anita Hill hearings were held and when the Rodney King trial and ensuing California riots took place, a discussion of the various points and issues took place among the subscribers to the lists like XCULT-L and WMST-L. Even discussions of the implications of movies like *The Crying Game* and books like *Backlash* are held in the list. The nomination of Joycelyn Elders for the Surgeon General position has been a recent item of discussion by list participants.

As previously mentioned, during the 1993 presidential campaign we obtained information about candidates' stands on issues from the BUSH, CLINTON, and PEROT lists. With the campaign over and the new administration in place, there are several interesting lists that have emerged to cater to both sides of the issues. For the "outs" a

Republican list called REPUB-L has served as a venue for scrutinizing the administration's appointments and policies. There are even three lists dedicated to Rush Limbaugh: RUSH, RUSH-L, and LIMBAUGH. For those who are "in," one of the vehicles for getting the message out to a large audience is through the networks. Thus we find efforts in all branches of government to make documents available to the public. The presidential branch of government makes available a few addresses to be used to make contact with the president and vice-president of the United States including: President@Whitehouse.Gov; Vice.President@Whitehouse.Gov; and Clinton-Info@Campaign92.Org. One can receive a summary of White House releases and schedules from a list that will automatically forward those summaries. Anyone interested can send a subscription to the following address: Almanac@Esusda.Gov with the following message in the body of the text: Subscribe WH-Summary. Postings on these lists that are interesting and relevant to a specific course can then be circulated to students via the instructor's own internal distribution list. Students can then be asked to give feedback on the material found in the network.

Incidentally, several members of Congress, including Newt Gingrich, are part of an experiment to get Congress online so that our representatives become more in touch with their constituents. The address to use to contact members of Congress is CONGRESS@HR.HOUSE.GOV.

The judicial branch of government is accessible via the networks as well. Supreme Court rulings in ASCII files are available at this FTP (file transfer protocol) site FTP.CWRU.EDU, and a law network with judicial information and catalogs can be found at the Telnet site SPARC-1.LAW.COLUMBIA.EDU or by using the Internet Protocol (IP) address Telnet 128.59.176.78 in order to get in.

One of the lists that provides valuable information from South East Asia is SEANET-L. We were able to receive the abstracts and proceedings of a conference on the Philippines held in Australia during the summer of 1992 from that list. It was an interesting and inexpensive way to keep up with current research about one's native country!

Some lists, like the Women's Studies list have been especially useful in the preparation of new courses. The list provides a syllabi exchange service that enables one to find out how others have structured introductory and specialized courses in Women's Studies, and to help select the best texts for Women's Studies courses.

Conference listings on the network can also be very helpful for professional growth and development. We have used postings in the appropriate lists to disseminate calls for papers and participants for the National Asian American Conference hosted by the University of Wisconsin-La Crosse and for the Hunger and Debt Institute hosted by Winona State University. We will once again use the network to call for participants at the Faculty Institute on Women and Issues of Development that we will direct in May 1994. In addition, one finds job listings and solicitations for collaborative research on the network. Thus, the lists serve as a major avenue for disseminating information.

In general, to obtain access to any of these lists, a faculty member or student must have an account on his/her institution's main computer. The individual must then subscribe to the lists of interest to him/her. To subscribe to any of these lists one needs to send an electronic mail message to LISTSERV@BITNIC.BITNET or the listserver that houses the discussion list that one is interested in, i.e. LISTSERV@UMDD.BITNET for the WMST-L (Women's Studies List). In the body of the message, type in only the command SUB WMST-L. You can substitute the name of any list that you wish to join. The Women's Studies List is used only as an example. Type your full name as well in the message. Thus, the full body of the text should read:

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SUB WMST-L Cecilia Manrique
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Since some lists are more active than others, be prepared either not to receive too much mail traffic or to be overwhelmed by messages which can reach hundreds per day. If you find that a list gets to be overwhelming for you or that some of the discussions are not to your advantage, you can unsubscribe to the list by sending a message to the same listserver with the message UNSUB WMST-L YOUR NAME. Reading your mail conscientiously and screening them like you would ordinary junk mail allows you to keep your account in order.

Where to Go for Help

Once one gets into the network, one will find that there are many friendly people out there who are more than willing to help a colleague. Two valuable sources of information within the network come from (1) Scott Yanoff, who constantly updates existing Telnet and FTP sites and provides that information almost on a monthly basis through a posting in the network and (2) an academic listing of discussion groups relevant to political science by Diane Kovacs, who has compiled this list from Anthropology to Zoology.

The ability to make use of what is on the network is limited only by one's imagination and one's willingness to explore. We have found this an effective way of drawing students out of learning merely from books which are often outdated into learning from what transpires around them. It allows them to be more confident of taking a critical look at the reliability of sources that are fed to them through various media. As an exercise, we let students experience the various aspects of what is available on the network. We help them to make use of these resources not only in our courses but in other courses as well. In fact, they are encouraged to provide us with constant feedback during and after the term. For the most part, students are awed by the new experience, but many take to it willingly — especially when they have a positive experience with the computers. We believe that one of the main reasons for not using the network is frustration with the computer system itself rather than lack of interest in what the networks have to offer.

Student Feedback

We have made it a point to obtain feedback from students regarding the use of Internet resources in our courses. This is accomplished through a short survey handed out at the end of the term. The survey is also a way of determining what works and what does not, in order to improve on activities for the following term.

It was clear from the evaluations that those who used the net consistently during a term found corresponding with the instructor, classmates, and others over the net most useful and were able to eventually appreciate the value of the resources available on the net. On the other hand, those who failed to go beyond the first exercise used excuses such as their technophobia, lack of time, or outright laziness.

Students have also been asked how they use electronic mail. Some used it to correspond with their other instructors, which was nice to hear because it reinforced the idea that this activity has linkages and impact in other courses within the institution. Some said they used it to correspond with their fellow students. Some tried to obtain information from other listserv lists after they were introduced to those resources. Those who enjoyed using electronic mail gave positive feedback about how they were able to use it to contact others outside of our specific courses.

The success of this activity is reflected in the fact that many students request to have their accounts retained for the following terms. Others express the desire to have home computers and modems so that they can still access the facility from their homes even if they are no longer in school.

Students are asked to provide feedback. For the most part, if the students open themselves to the experience it becomes a positive one for them and one that they can take with them to other courses and into the workplace. In that sense we see the network as a means of improving teaching and rapport with students. It also allows for the dissemination and creation of new ideas within academe. And finally, experience with the network can provide students with access to electronic information which allows them to be competitive in the workplace. Thus, in our increasingly global marketplace, our efforts in this direction can contribute to the transfer of technology to young minds who will eventually be responsible for future decision making.

Where Can We Go from Here?

The answer to that question is certainly anywhere and everywhere. What the networks offer is limitless, bounded only by our inability to tap in to what is available. An introduction to the networks hopefully broadens students' horizons. The diversity of the groups represented in the list shows fertile areas inwhich students can become engaged.

Skeptics will probably wonder what computing has to do with the types of courses we teach in the social sciences. They may argue that computing has no place in these courses. They will need to be gradually eased into the acceptance of technology in courses outside of computer science, and their tolerance for computers will depend on their initial experience with computers. We will also find that a good number of students realize the value of computer technology only after leaving the hated class that required them to write and communicate by means of a computer.

A good strategy to overcome some of these difficulties, is to make this a fun learning, nonthreatening, experience for students. Computer activities should not be forced upon students on the first class day but rather presented as a useful exercise which they can choose if they desire. A few class periods may need to be devoted to helping students unravel some of the basic features of using the system available to them.

At the same time, faculty members should exude a level of confidence that will allow students to see the same values that instructors wish to impart concerning the use of computers and electronic mail. It helps if a faculty member can answer most, if not all, of students' questions so that they do not need to be sent to the computing "gurus" in the computer center, who may not be sympathetic to what students and faculty members want to accomplish. Maintaining an amiable, professional, working relationship with the computing services staff is always beneficial to all parties involved, especially when technical problems beyond the instructor's ability arise.

Faculty should also be prepared with a list of potential contacts with whom students can immediately communicate. Nothing is more frustrating than to have to "look around" in the network for someone who will be willing to spend time communicating with your students. It is a commitment, and those who take that commitment seriously will have a good experience. Those who get someone who communicates spottily is likely to be frustrated. Much of this will be beyond the instructor's control but the various parties involved need to be aware of it.

There are substantial resources available just waiting to be tapped by instructors and students. As we have indicated, professional development can be enhanced by using network resources. Collaborative projects, syllabi exchanges, and calls for papers and conference participation are just the beginning of what can transacted on the network. For students, the network has been a source of diversion from the usual "chalk and talk" in the classroom. It helps to reinforce learning and encourages them to think of the issues outside of the hour spent in the classroom. In other words, the network can be used for active and collaborative learning.

Cluster Session (T26B)

HKIS Dragon BBS Developing a Community Communications and Information System

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Keywords: BBS, bulletin board system, networking, telecommunications

Abstract

*Over the past two years the faculty and students of Hong Kong International School have been developing the **HKIS Dragon BBS,** with over 1,000 members, 50 conferences, CD-ROM access, thousands of shareware files, and a special feature called CLASSLink that ties seventeen schools in Hong Kong into common discussion areas. One teacher-prepared report called the class conferences and "Doors" to information an "instructional bonanza." The presentation will include an actual demonstration of the BBS and focus on curricular and community life applications.*

HKIS Dragon BBS – Development and Structure

In the fall of 1991 the Dragon BBS was launched, with the initial goals of involving advanced computer students in a community service project and making available the information resources of the school networks to families during evenings and weekends. We installed the Wildcat BBS from Mustang Software that allowed for local logins and was designed to work well in a network environment. During the day students and faculty could access the BBS from any of the three computer labs, and at night they could connect from their home computer.

From the beginning there were three basic components to the BBS:

(1) Conference Areas – E-Mail, American Political Debate, and School Issues were some of the first conferences. Class conferences followed soon thereafter. CLASSLink is a regional echo mail system that automatically sends messages collected in certain conferences at our school to other schools in the city.

(2) Files – Shareware files that were downloadable interested many students. Several shareware CD-ROM disks provide over 7,000 files. The best student-written programs are also made available.

(3) "Doors" – This feature allows remote users to exit the BBS temporarily and run selected programs on the network, such as the school library catalog and a

student directory. Most important are the doors to the CD-ROM tower, including the Newsbank disk of periodicals. Parents also liked the college guidance software, but students were attracted to a few remote interactive games.

We currently have nine student managers called Systems Operators (SysOps), as well as a number of student conference moderators. Most high school students and around 30 percent of the faculty are active members of the BBS. There are ten dial-in lines, six of them operating 24 hours at 14400 baud. High-speed modems are particularly useful for CD-ROM access and file downloading. This year we have completed network cabling for the entire high school which will allow local login capability from all offices and classrooms. SysOps and other students have been actively involved in training teachers, other students, and families in the use of the BBS. Documentation and guides are being written by the students.

The BBS in the Classroom and School Life

The following list illustrates some of the educational values experienced by teachers as they work with the BBS:

1. Ongoing Classroom Conversations – One of the first class conferences was sponsored by an English teacher on the Experimental Novel. Students went back and forth between discussions in class and on the BBS, bringing new insights with them and significantly deepening the level of conversation.

2. Developing Public Writing – Most conferences written on a BBS are public. Students work harder at expressing themselves knowing that every person will read the entry, not just the teacher. Each year our school, like many others, emphasizes drug and alcohol education. The Health/Wellness conference produced student entries good enough to be shared with the citywide health council.

3. Forging Community Values – Several "hot" issues were dealt with in the Student Issues conference, including behavior and ethics on the BBS and a proposed new class schedule. All E-mail systems must deal with insensitive responses to messages, called "flames." Students and teachers are often surprised that they are considered "flame" writers. SysOps and faculty advisors are always working on training in proper BBS etiquette.

4. Releasing Students to Communicate – Our school is 60 percent American, yet many are ethnic Asians. Some are not culturally accustomed to verbal discourse even when encouraged. The social studies teachers report surprising differences between class participation and BBS participation from many such students. They become more confident and engaged in the issues involved on the BBS.

5. Telecommunications Simulations – Our school participates in many telecommunications projects, including the University of Michigan simulations

and the AT&T Learning Network. This spring one social studies class created a version of a simulation on the Arab-Israeli conflict to run on the BBS. The advantage of a local simulation is that it allows the flexibility of following your preferred time schedule and intensifies the whole experience.

6. Modern Language Tools – The Spanish and French conferences have been valuable tools for modern language instruction. These conferences follow their philosophy of encouraging communication skills first, followed by grammar instruction.

7. Faculty Study Groups – The Faculty Forum conference, open only to faculty and administration, allows for in-depth conversation on books and educational issues without requiring more meeting times. Issues can be discussed and gossip/rumors diffused. Our staff development team is eager to expand on this resource.

Creating a community communications system is an enormous yet rewarding challenge. We would encourage others to join in this experiment and would appreciate thoughtful participation from the research community in helping us understand how local electronic communities can change the structure of education.

Cluster Session (T26C)

Nanaimo Schools NET and the Year 2000 in British Columbia

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Abstract

This demonstration session shows how a locally developed Internet-based Bulletin Board System is used by the educational community in the district. The system was developed to provide Internet access to the students, teachers, and public of Nanaimo School District. Although similar to the Freenet concept, it is not a Freenet associate.

The demonstration will consist of logging on to the Nanaimo SchoolsNET and viewing the options that are available. The discussion will cover how the teachers in the district use the board to aid in meeting the philosophy of the Year 2000 Curriculum and Educational Change.

Activities and lessons will be demonstrated that help to provide an environment for self-guided learning and movement toward an information-based society. Student activities and teacher lessons will be presented. The methods that were used for inservice staff and to make this technology easily accessible in the classroom will be discussed. An overview of the district networking scheme will also be provided.

This demonstration can be hands-on if the equipment and a connection to Internet can be arranged.

The emphasis will be on classroom uses and activities — how a teacher can use this technology to enhance his/her curriculum. Activities and projects completed by teachers and students will presented. Also discussed will be how to use NASA Spacelink, Cyberion City, and a variety of others sites in the classroom to aid in the integration of math, science, and language arts.

Biography

Mike Silverton has been involved with educational technology for the last ten years. He is presently the Educational Computer Consultant for the Nanaimo School District. He has used technology in his classrooms and inservices teachers on effective use of technology in their classrooms. Mike is the system administrator of the Nanaimo SchoolsNET and has spent much of the last few years demonstrating the educational value of telecommunications and Internet.

Cluster Session (T27D)

DESERTS: Effects upon Man/Man's Effect on Deserts

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Keywords: desert, environment, telecommunications, curriculum

Abstract

Virginia City HS, NV, students and staff were the "Lighthouse" coordinators for this Environmental Watch project. Through telecommunications, responses were gathered related to past/present conditions of current desert areas, desert experiences, and

environmental research. Information is also presented concerning analysis of this project/activity and environmental desert concerns derived from research done to date.

Introduction

This report discusses one of the six Computer Pals across the World (CPAW) Environmental Watch projects completed during the 1992-93 school year.

Aims:

- To identify global and local environmental concerns related to deserts.
- To develop skills/mechanisms to investigate the issues identified.
- To devise and communicate environmental action plans.
- To lend support to the environmental cause by communicating these plans and concerns to appropriate people or organizations.

Hypotheses developed:

- The desert is man's future land bank.
- Climatic conditions (past and present) will influence our current and future deserts.
- Man and the desert have an ecosystem dependency.

Project Organization

The Lighthouse coordinators were secondary teachers/students in computer applications and advanced biology classes. Curriculum areas directly addressed in this project were computer literacy/applications and science (biology, environmental science, and geology). Other areas dealt with included Fine Arts (dance), Language Arts, Critical Thinking, Math, Social Skills, World Problems, and Study/Research Skills.

Ten climaticalogical data-gathering questions and a request for narrative information concerning desert-related experiences were sent to potential participants. Keyword clustering was used to retrieve information from narratives for comparison with data gathered. The Koeppen climatic classification of ecological formations was used as a base for data gathering.

Results: Man's Effect on the Desert/Desert's Effect on Man

The eleven respondent groups were from four continents and included individuals from Australia, Russia, Norway, Egypt, and the USA. These people included senior citizens, elementary through post-secondary students/teachers, and a political analyst. Their responses and research found in other telecommunications sources were analyzed and issues brainstormed. The resulting issues/related questions forwarded to Environmental Watch participants and IUCN for further consideration are listed below (Warner et al, 1993):

- Solitude/lack of noise pollution

- Deforestation and effect of vegetation on temperatures
- Historical and current extinction of flora/fauna
- Use of the desert areas as nuclear dumps
- Depletion of ozone layer
- Use of underground water supplies
- Safety/survival in the desert
- Reclamation of desert for food
- Ecosystem dependency

Analysis of Project Process/Side Effects

Lighthouse coordinators felt that much was learned about process, knowledge of desert, and teamwork methodology. We also worked with ten "side effects" that influenced the learning process and project management, including:

- Direct contact (rather than a "generic" notice) with those we wished to have participate increased percentage of participation.
- Originality in response (i.e., original desert dance arrangement and narrative responses) allowed issues to have meaning for nonscientific groups.
- Keyword clustering of narrative responses helped document data-gathering responses.
- The need to respect time required to respond was identified.
- A feeling of project ownership and a pride in work completed was developed.
- The need tto arrange class schedules for teacher/students to minimize disruptions was realized.

Summary

Millions of square miles of desert make up the last vast livable areas that remain largely uninhabited by our swiftly multiplying human species. HOW WILL WE AS INHABITANTS OF THIS WORLD DEAL WITH THIS SPACE?

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Cluster Session (T27E)

A Bird in the Hand: The Endangered Species Telecommunications Project

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Keywords: endangered, environmental, education, classroom, computer-mediated communication, CMC, telecommunication

Abstract

The Endangered Species Project is a successful cross-curricular project (grades 4-7) incorporating hands-on classroom activities, data collection, computer-mediated communication, and live interactive television. This session presents highlights from: teacher training session, classwork, telecomputing activities, and television components.

Project Summary

The Kentucky Science and Technology Council, Inc., and KET, The Kentucky Network, developed a telecommunications-based instructional unit, using the theme of Kentucky's endangered species, to illustrate the potential for communications technology to enhance student learning. The unit is targeted for students in grades 4-7.

The Endangered Species Telecommunications Project was piloted using seven Kentucky schools in spring 1992. Fifty-five teachers in thirty schools registered for participation in the spring of 1993. The project was so successful that it is being offered again during the 1993-94 school year. The Endangered Species Telecommunications Project fosters students' investigative skills, communication skills, and use of technology through a combination of activity-centered instructional strategies, the use of computer-mediated communication (CMC), and interactive television. Participating schools are grouped into "teams" from the six physiographic regions of the state. The team grouping organized communications among students in the participating classes. An important component of the project is an all-day training session for participating teachers. Teachers are trained to: use the curriculum materials in the classroom, access KET-Net (KET's computer bulletin board for Kentucky teachers) using a DOS or Apple computer, and establish bird feeders.

Project Goals

Goals of the unit are for students to
(1) strengthen skills related to scientific investigations and data analysis;
(2) examine basic ecological concepts (such as habitat, adaptation, predator/prey, and environmental factors) through application to a Kentucky-specific topic;
(3) learn basic concepts and procedures for telecommunications.

Classroom Activities

Features of the eight-week unit are

(1) cross-curricular student activities which were adapted from Project WILD, Kentucky ACES (Activity Centered Elementary Science), A Home for Pearl instructional video, Kentucky's Natural Wonders Teachers Guide, and other curriculum materials;
(2) discussion topics which explored the concepts of habitat and habitat loss, environmental factors, adaptation, predator/prey, and human impact;
(3) communication with other schools in the group via KET-Net, an electronic bulletin board operated by KET for Kentucky educators. Activity data from the schools were compiled and posted on-line for other schools to analyze;.
(4) interaction with Kentucky experts during four live telecasts over KET's Star Channel (a statewide satellite education network).

CMC Activities

The telecommunications activities on KET-Net are

Teleplay – Students played a simulation game which explained the concept of telecomputing.

Hello Letter – Students collected data about themselves, their school, surrounding community, landscape and natural resources, economy, transportation, and entertainment, and wrote a letter to share on-line.

Oh, Deer! – Students telecommunicated the data collected from a simulation activity that involved factors in natural habitat.

Nature Names – Students searched for names (using references such as maps and telephone directories) of places in their community that are named for plants and animals. They compared their lists to lists from team schools to learn similarities and regional differences.

Bird Watch Data – Students made bird feeders from recyclable materials as a class project and selected the most appropriate location on campus to post them. Twice daily — am and pm — students observed and recorded the types and frequency of birds using the feeder. The data was averaged, placed on a spreadsheet grid, and posted on-line. Statewide data were analyzed by online experts by state regions to examine the frequency and diversity of birds. This analysis was shared on KET-Net and in the final television broadcast.

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Cluster Session (T28A)
An Institute for On-Line Learning

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Keywords: writing, telecommunications, computer-mediated communications, teacher education

Abstract

This past August, the Faculty of Education at York University in Toronto sponsored a Summer Institute in On-Line Learning in collaboration with the faculty's Centre for the Study of Computers in Education. The first institute was invitational, primarily involving boards of education that are associated with York's pre- or inservice programs. This session reports on the institute.

Why Have It?

Many Ontario schools and boards are participating in or operating their own educational experiences using telecommunications. Classroom teachers are discussing the impact of on-line activity on classroom learning. The institute set out to provide a forum within which to consider what on-line learning looks like in schools now and inform an emerging understanding of the impact of this medium on classroom practice.

The first institute focused on two areas:

- moderating online experiences
- curriculum integration with, and of, telecommunications

All participants were asked to participate in a working group in which to meet and determine what they would like from the institute and how they might assist one another in developing approaches to on-line learning in their own boards. York will maintain involvement with these boards through our on-line systems.

Face-to-face and On-line Components

The institute offered face-to-face and on-line experiences, including:

- seminars with featured guests in sessions on campus
- task-oriented break-out groups with on-line educators
- on-line discussions with national and international guests
- planning with the institute "Resource Team," a group of educators who operate educational telecommunications-based services and programs.

Participants were responsible for planning their own experiences at the institute, attending sessions, meeting in their groups, participating in on-line conferences, and so on. Speakers and presenters included:

Linda Harasim, Simon Fraser University (author of *Online Education*)
Lynne Schrum, State University of New York
David Porter, Open Learning Agency of B.C.
Bob McLean, Ontario Institute for Studies in Education
Judi Harris, University of Texas at Austin (author of "Mining the Internet")
Margaret Riel, AT&T Learning Network

Pat Redhead, Canadian Geography Game (Alberta Teachers' Association)
John Ord, Kids from Kanata (SciLink)
Trevor Owen, Writers in Electronic Residence
Peter Hutcher, World Classroom (Global Learning Corporation)
Mike Burleigh, Director, KIDLINK (UK)
and others.

The on-line component was undertaken on Current Practice, the online network of York's Faculty of Education. The network brings on-line learning opportunities to the pre- and inservice programs of the faculty, as well as undergraduate and graduate programs. Given the strong relationship between the faculty and the teaching profession, Current Practice serves teachers and school boards that want to establish and operate on-line learning programs with strong links to teacher education.

Project-driven

A key element of the faculty's approach that it is driven by projects rather than by the availability of technology, providing an on-line home to specific initiatives in an effort to inform teaching practice in on-line learning programs. In keeping with York's view of teacher education as a continuum, Current Practice serves to complement, rather than duplicate, the many excellent information and communications services currently offered to teachers through BBS systems and other networks.

York is developing links with other teacher education programs that are interested in explorations of this kind. For further information, please E-mail: education@yorku.ca

Cluster Session (T28B)

Going Global: What's Possible, What Works, and What's Worth the Trouble

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Keywords: international telecollaboration; text-based interactive CMC; human, cross-cultural, technical, logistical aspects

Abstract

Telecollaboration commonly occurs among essentially similar groups. International projects, however, can successfully combine dissimilar nationalities, cultures, disciplines, educational goals, and skill levels. Success depends on using available facilities wisely, obtaining adequate technical support, defining compatible educational goals, developing workable project structures, and paying careful attention to human and cross-cultural factors.

Telecollaboration commonly occurs among geographically distant but essentially similar groups; we match ESL with ESL, Ed. Tech. with Ed. Tech., and MIS with MIS. Then we ask them to work together to produce a joint product. Our students are thus able to exchange ideas and information with a larger community of learners, yet we remain on familiar disciplinary territory. International projects, however, can successfully combine dissimilar nationalities, cultures, disciplines, educational goals, and skill levels. Success depends on using available facilities wisely, obtaining adequate technical support, defining compatible educational goals, developing workable project structures, and paying careful attention to human and cross-cultural factors.

Text-based CMC (computer-mediated communication) includes asynchronous E-mail, bulletin board systems, and conferencing systems (like VAX_NOTES) and synchronous forms (VAX_PHONE, TALK, IRC, and MUDs, MOOs, MUSEs). LAN-based (Local Area Network) conferencing packages combine the two types of facilities, but there currently are no analogous packages for international use. Because of its wide availability, E-mail is the usual common denominator in international CMC.

However, combining E-mail with other CMC forms can enhance learning. For example, students can get acquainted and begin project work via E-mail, then use PHONE to discuss and revise drafts.

Combining CMC forms requires the support of technical staff, since it involves arranging limited outside access to one or more hosts; however, official policy may prohibit such access. Just as faculty need to rethink the syllabus, computer center staff may need to reconsider certain aspects of their defined mission to accommodate international projects. What access is needed? Limited-access accounts for overseas students and faculty on a Telnet-accessible host (with TALK or PHONE) provide the technical basis for many different projects: bilingual penpals, learning circles, collaborative writing, and even simulations. Faculty access is an invaluable aid in working out project logistics, tracking progress, clarifying misunderstandings, and writing jointly authored articles.

With or without joint access, the relationships among the faculty involved are crucial to the success of international collaborative projects. Because many (if not most) projects are carried out by E-colleagues who have never met each other in person, it is especially important that adequate amounts of time and energy be invested in developing this relationship. Keys to good collaborative relationships include maintaining frequent and regular E-contact; demonstrating interest in the other's educational goals; expressing concern over unexpected silences; being aware of and interested in learning more about cultural differences, taboos, and expectations; and above all, being reliable, open, honest, and as human as possible — in short, being the kind of colleague who is valued and trusted in nonvirtual space as well.

CMC-linked classrooms bring new challenges: technical and human failures, scheduling difficulties, misunderstandings, altered classroom dynamics. Tasks need to be clearly defined and communicated to all participants. They need to be large enough to be worth the investment of time and energy (yours and the students') but limited enough to be completed within an often perversely Murphy-esque universe. Finally, tasks should be consistent with overall course goals. Thus, second-year FL goals include improving vocabulary and written communication skills; these can be well served by a bilingual penpal exchange with set topics, instruction in standard formulations, and careful debriefings.

Expectations and goals need not be identical for all groups, but they must be compatible. Understanding current uses of technology in American education and how U.S. practices compare to those in Japan or Germany is a likely goal in a course on educational technology; German EFL engineering students can easily act as informants in such a project, though their learning goals may be quite different.

Many students are not well prepared for text-based communication per se, let alone cross-cultural exchanges. They may lack basic CMC social skills: how to introduce themselves, give personal information, keep a correspondence going. They may need to become aware of their language use, particularly idiomatic and slang expressions, if they are working with EFL students. Finally, they may need to learn about beliefs and stereotypes and their impact on the interpretation of behavior. Ideally, cultural mediation works in both directions, but one of the instructors involved must be competent in both cultures. Debriefing, a concept central to simulations, can be an extremely important tool in this process. Despite CMC's reputation for volatility, if used responsibly it offers an excellent medium for improving cross-cultural understanding. One doesn't have to know all the answers, but one does need to be willing to learn.

Cluster Session (T28C)

On-line Training for On-line Information-Retrieval Systems

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Keywords: distance learning, computer conferencing, databases, university, adult education, information retrieval

Abstract

This presentation describes the development and delivery of teaching on-line training for on-line information-retrieval systems. Beginning and advanced courses use the On-line Training and Practice (ONTAP) databases of Dialog Information Services, Inc., and the asynchronous computer-conferencing capabilities of Unison's PARTI software to deliver skills training over the modem. Since 1989, Connected Education, Inc., and the Media Studies Program, New School for Social Research, New York, have offered both courses for graduate academic credit. Course development reflects my experiences earning the first M.A. in Media Studies ever granted solely through on-line study by the New School.

On-line databases like those of Dialog Information Services, Inc., provide in-person training, but, beyond help files, on-line training for using other on-line databases has been largely nonexistent. On-line databases contain items of information, or records, about specific disciplines or categories of documents, collected in machine-readable form (Dialog Information Services, Inc., 1991). A need to provide on-line production training components for an accredited graduate degree program motivated me to develop and teach two courses in computer skills with both lecture and laboratory components available on-line.

The two courses discussed in this presentation cover the use of introductory and advanced on-line information-retrieval systems. Connected Education, Inc., a New York State not-for-profit educational corporation, has continually presented on-line courses for academic credit through the Media Studies program since 1985. Paul Levinson, Ph.D., president of Connected Education, Inc., founded and directs the New School on-line program through which students can earn the M.A. in Media Studies degree entirely on-line. Besides a thesis and theory and survey courses, matriculated online students must complete production "skills" courses. On-line instruction in information-retrieval systems provides a hands-on production training option to fulfill this "skills" requirement.

Practical experience proves the feasibility of teaching on-line information retrieval systems. The Sprintnet value-added carrier serves as a virtual corridor between the Connect Ed electronic classroom on Unison and the computer applications lab of ONTAP training databases. Students remain on the same phone call to their local Sprintnet node and switch from theory to practice and back again by signing off and on the appropriate system addresses. Computer skills training takes place at the respective student's convenience of time, place, and terminal. Physically disabled and non-disabled students participate on an equal basis, with computer technology removing access barriers to learning.

Both introductory and advanced courses in on-line information-retrieval systems help satisfy the production course requirement for the on-line M.A. in Media Studies. Directed searching enables students to try specific searches in the ONTAP practice databases, then check their results against transcripts of the instructor's search posted in a subtopic to the main course conference. Brock N. Meeks, a reporter for *Communications Daily*, called the introductory course "one of [Connected Education's] most popular courses" (Meeks, 1992).

Adaptations of existing methods helped create an interactive on-line computer lab component for the hands-on study of on-line information-retrieval systems. The two resulting practical, popular courses provide real-world transferable searching skills while helping students fulfill production course requirements for the on-line degree. Actual student experience proves the feasibility of a practical solution to the problem of providing hands-on production courses on-line.

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Cluster Session (T29A)
From Russia with Love

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Keywords: telecommunications, curricular projects, E-mail, student exchange program

Abstract

Using Internet to add a new technological dimension to a student exchange program between my school (Capt. Nathan Hale School in Coventry, CT) and our exchange school (# 1088) in Moscow, Russia, is the focus of this project. The E-mail aspect of Internet was used by my students to communicate with classes back in Coventry as well as a local newspaper, which then published the letters written by students. The published letters were used in a series of articles about our experiences in Russia. After newspaper publication, the articles were then faxed back to us in Russia where we discussed with our Russian hosts the content of the articles.

Objective(s) of Lesson: While in Russia, to use the computer and Internet to provide a telecommunications link between the exchange participants in Russia and the parents, students, and administration back in the United States. Second, to use the Internet connection to provide to our local newspaper information regarding our experiences for use in a series of newspaper articles. And last, to demonstrate to our Russian host school the value of telecommunications in bridging the gap in communications and cementing the relationship between the two transoceanic schools.

Hardware/Software Needed: Computers capable of sending and receiving messages relayed via modem. Appropriate telecommunications software. Fax machines on both sides of the ocean.

Telecommunication Resources Needed or Recommended: Internet. The role of telecommunications in this plan is VITAL. The plan will not work without telecommunications capability.

Curriculum Area(s) Involved: Language arts, social studies, current events

Grade Level(s) Targeted: 6, 7, and 8

Class Management Strategies: Actually the first strategy required is a logistical one. We needed someone in Russia to send information back to the United States, and we needed someone in the United States to coordinate the receipt of the information, forward the information to the newspaper, and then fax the newspaper articles back to Russia. Receipt of the letters sent from Russia addressed to the students in the United States required the classroom teacher to divide his/her class into workable groups to read and answer the letters sent.

Procedures/Activities: For the past several years my school has been involved in an exchange with a school in Moscow. What began as an attempt to acquire pen-pals in the former Soviet Union actually escalated to a full-fledged student exchange. During my second visit to Moscow, I discovered that our exchange school in Russia had a limited access to E-mail via Internet. Upon my return to the United States, I was able to persuade a local university to provide me and my school with a guest account enabling us to access Internet. Initially, we used the E-mail capability to send information back and forth concerning our upcoming third exchange.

After hosting our Russian visitors, we thought it would be a great idea if, while we were in Russia, we could use Internet to keep everyone back home informed of our impressions of Russia, send letters back to the students of our school, and in general keep everyone back in the United States informed as to how things were going. Part of my plan involved having several of the American exchange students visit younger grades (i.e., grades 2 thru 4) and having the students develop a list of questions for the American exchange participants to find out about while in Russia. For example, do they have reading groups in Russia, do they have fire drills, what are the school lunches like, etc. Upon our return the older students would return to the classrooms and answer the questions and in general offer any other information. Then the idea! Why not use the Internet to send letters back to the classes in the United States? It was so obvious!

We then expanded upon our idea. A local newspaper agreed to publish letters written by four of my students while in Russia if we could "deliver" them to the newspapers. After the articles were published, we would fax them back to our host school in Russia and discuss with the Russians what appeared in the newspaper.

Before leaving for our third exchange, we set up a series of dates when we would send letters to the United States, a teacher back in the States would check the Internet for the letters and then forward them to the newspaper and the appropriate classes. After the articles appeared in the press, the same teacher would fax the articles back to us in Russia.

It was hoped that all the letters from Russia to the students and newspaper back home would stimulate much discussion and provide a thrill for the younger children that could not be matched.

Method(s) for Evaluating Student Achievement of Objective(s): Well, the first part of evaluation is easy, the plan worked like a charm. There was no problem in sending the information back to the States, and there was no problem in faxing back the information. Since I literally just returned from the exchange, all the feedback as to what happened in the individual American classrooms is incomplete, but what I do have has been extremely favorable. Both the Russian and the American reactions to the newspaper articles have been amazement and sheer ecstasy. It's incredible for some townspeople to actually see letters being written by seventh-grade students in Russia appearing in the evening newspaper!

Future Ideas: A Joint Venture Perhaps: How about a co-school newspaper published by the exchange schools? How about newspaper editorials being discussed by groups of students on both sides of the ocean? How about stories being coauthored by students thousands of miles away? Well, the list goes on and on. I have just started to pursue some of these ideas, for truly, the sky is the limit.

Cluster Session (T29B)
Young in the Thirties, Old in the Nineties

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Keywords: telecommunications, Denmark, social studies, curriculum projects

This interdisciplinary project involved students' learning about differences between themselves and old people in four areas:

1. Work and spare time in the thirties
2. Housing conditions in the thirties
3. Political situation in the thirties
4. Interviews with old people about politics, housing conditions, work and spare time in the thirties.

For this theme we had contacted the local welfare center for old people. A welfare center is a place where old people can meet during the daytime and do different hobbies. Their findings were shared with students in Greece and then exhibited at their own school.

Objective(s) of Lesson: To understand your own situation better by learning about the past in your own area as well as in another country. To get a better knowledge of life in another country.

Hardware/Software Needed: A personal computer with modem and communication program

Importance (Role) of Telecommunications in This Plan: Telecomputing was a part of the English lessons in the project. It was motivating for the pupils to know that the things they wrote about the project would be read with interest by other pupils. Their writing in English had a meaning. They did not just write because the teacher told them to, but because they really had something to write about. The importance of telecommunications in this project was that we could exchange information very quickly and flexibly. We could ask each other questions about the information if we were not quite satisfied with the answers.

Curriculum Area(s) Involved: Danish, English, German, history and social studies

Grade Level(s) Targeted: Two 10th form (40 pupils)

Procedures: The first week the only difference from normal teaching was that all the lessons apart from Maths/Physics dealt with facts about life in the thirties. The pupils read short stories, saw films, and read history books. They also saw a play at the local theater that had been written in the thirties. At the end of the week they could choose from four themes for the next week, and they were expected to have found information for a poster exhibition at the school. They could find this information in books and by taking notes when asking questions to guest teachers.

The second week was the actual project week. The pupils had no "normal" lessons. The group (ten pupils) interviewing old people wasaway from school for two hours with one teacher Monday and Tuesday. The rest of the pupils stayed at the school and received guest teachers. The guest teachers were (1) Margit Christensen, social worker from the local social security office who spoke about old people in their own homes, and (2) Rigmor Buhl, a representative for an organization fighting for the rights of old people.

On Wednesday, the two classes went to see an exhibition about the twenties and thirties. They also went for a walk in an area built in the thirties, guided by an estate agent. The remainder of the week was spent working on reports.

The third week, two former pupils from the Sanderum School came as guest teachers, talking about their first difficult years after leaving school, and on Friday, the poster exhibition established. Telecomputing was a part of the English lessons in the project. We used the facts from the project week as background material. The pupils continued their work in the same four groups and translated the information into English. This information was sent by E-mail to our partner in Athens, Elias Koutoulakis, whose pupils did the same.

Evaluation: Here is an extract from a letter from Elias Koutoulakis to illustrate the effect of the project: Our "EuroGlossae" School of Foreign Languages in Athens has been successfully linked to the Sanderumschool in Odense, Denmark. The project "young in the thirties, old in the eighties" proposed by our partners in Denmark, seems to have highly motivated our pre-First Certificate in English pupils who are in general rather unwilling to do projects! (I think this is the case with most pupils in the globe!)

How the class was automatically divided into the four predefined groups when they were presented with the project and after seeing the self-presentations of the Sanderum School pupils, is, believe me, beyond my understanding. They set off to collect the information requested, and in less than four days presented me with their work completed. They even proofread one another's work before keying it in. Dr. Zlatkus Giedrius from Lithuania has shown interest in our project. I have sent him its outline so that he will also work on it. As soon as I have his response to it, I will let you know.

I will also start contacting people in Greece who may be interested in our project, though some of them are a little intimidated by the prospect of using computers. I hope they, among others, will overcome their computerphobia in the end.

Method(s) for Evaluating Student Achievement of Objective(s): Poster Exhibition. Letters sent by E-mail.

Cluster Session (T29C)
The TeleConnected Food Festival

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Keywords: telecommunications, curricular projects

Abstract

This activity is designed to introduce our class to E-mail interactions and create an awareness of other cultures. The class will request and collect recipes that represent the local culture of students from around the country and world using E-mail. They will organize the recipes in a form that can be transmitted electronically to anyone who submits a recipe to the collection or requests the collection. The class will track their responses on a world map. The students (and their parents) will be asked to prepare one of the recipes for the TeleConnected Food Festival to be held on May 6, 7, & 8, 1993, in conjunction with the Big Days of KIDS-93.

Objective(s) of Lesson:

1. The students will use software to create files off line to upload and send electronically.
2. The students will use E-mail to request, send, and receive recipes to/from other students.
3. The students will track the responses on a world map.
4. The students will organize the recipes collected into a format that can be transmitted electronically to all participants and posted on bulletin boards.
5. The students (with help from their parents) will prepare and taste the recipes prepared to introduce them to the eating styles/preferences of other students around the country or world.

Hardware/Software: Apple IIe, Zoom modem, floppy disks, printer, Appleworks, Proterm, phone line, Learning Link account

Telecommunications Resources Needed or Recommended: Direct Internet access would be ideal.

Importance (Role) of Telecommunications in This Plan: Essential. It would be impossible to complete a project like this on our timeline using other resources (ex. - snail mail).

Curriculum Area(s) involved: Computer use skills, multicultural interaction

Grade Level(s) Targeted: grades 6-8

Class Management Strategies: I will train the class to do the skills required and then be a guide on the side for the remainder of the project.

Class Time Required: One period a week for ten weeks.

Print Materials Needed: Appleworks handout, proterm handout, world map

Procedures/Activities:

1. Teach the students to create and save files as ASCII using Appleworks.
2. Teach students to send saved ASCII files using Proterm.
3. Teach students to use the KIDS-93 LISTSERV to connect to other students on the project.
4. The students will prepare and introduce their TeleConnected Food Festival materials to other students around the world.
5. Students will learn to save E-mail to a floppy disk and send info.
6. Students are responsible for tracking their responses on a world map.
7. The students will organize the "recipe book" for E-mail transmission.
8. The students prepare and enjoy the TeleConnected Food Festival.

Method(s) for Evaluating Student Achievement of Objective(s):

1. Student demonstration of telecommunications skills
2. Teacher examination of saved files or printouts
3. Post-project survey
4. Teacher observation of wall map

Cluster Session (29D)

Interacting with Newsgroups

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Keywords: telecommunications, curricular projects, social interactions

Abstract

This telecomputing activity was designed to help university students understand firsthand about communication issues covered by sociologists like Sproull and Kiesler (in their book, Connections: New Ways of Working in the Networked Organization, *for example). While the lecturer talked "in theory" about these effects, the students, by observing and studying the kinds of interactions carried on a social network, came to their own conclusions about the efficacy of this mode of communication.*

Objectives of Lesson:

1. The students will learn firsthand about some of the social issues related to electronic newsgroups. One student, for instance wrote: "Having witnessed firsthand what may happen when posting an article, it has made me realize that a posting has to be well planned or the end result could get quite flaming. Even the heading has to be considered with thought." A lecturer can "tell" a student that, but the student really has to learn it for herself.
2. The students realize the extent of the communication networks that exist. One student, in her report, for instance, wrote: "I would certainly continue to monitor (and probably contribute to) this newsgroup in the future. It has given me a broad range of topics to consider and a large group of people with a wide and varied knowledge base on whom I can draw for information."

Telecommunication Resources Needed: Userids to make contact with Internet newsgroups; workstations for students to access, copy, and write to newsgroups

Importance of Telecommunications in This Plan: Students had the opportunity of finding out for themselves some of the observations and conclusions reached by researchers in the field of electronic communication. This exercise takes "theory" and brings it into the students' world.

Curriculum Area Involved: First-year social science course, "Computers in Society" (150 students in a two-hour lecture, one-hour seminar format; students had access to a computer lab).

Grade Level Targeted: First- and second-year university students

Class Management Strategies: Students were E-mailed instructions on how to use the newsgroup interface software and what their assignment entailed. Students could E-mail the lecturer if there were questions about the software and/or the assignment.

Class Time Required: Some seminar time was allocated to this activity, but students had to monitor newsgroups for two weeks and so they did this in their own time when the computer lab was open.

Procedures/Activities: These instructions are taken from the electronic communiqué that all students received:

To give yourself some basis for comparison, monitor (that is, read carefully) at least two newsgroups for two weeks. Pick a group from the "soc" ["society" newsgroups) and one from another main group, for example, "rec" ["recreation" newsgroups]. Once you have "lurked" for a while, pick one group you would like to focus on for your report. The assignment asks you to "observe" on-line communication. Think about some of the ideas discussed in lecture and in your text book about the characteristics of face-to-face and electronic communication.

Essentially you will be making preliminary observations about the kind of communication that goes on in one group. Here are a number of questions you can consider when observing the newsgroups. Please come up with your own questions as well. You do not need to use these questions directly in your written report.

- Who contributes articles? Male and/or females? How frequently do names reappear? Do people respond to each other?
- What do you learn about these people? What do they do? Look for the way they sign their names. What does this tell you?
- What use do they make of conventions for indicating the intentionality of their words? (For instance, "smilies," capitals, other symbols, etc.)
- What's the level of discussion? (The extreme would be "flaming")

In your 750-word report, reflect on the strengths and weaknesses of this mode of communication as YOU have observed from the particular newsgroup. Provide specific examples when you make a point. Assuming your own interest in the

Newsgroup, would you continue to monitor (and add messages) to a Newsgroup? (Please explain your reasons.)

Methods for Evaluating Student Achievement Objective: Students' reports were evaluated on the basis of

(1) their integration of theory with their own observations,
(2) their use of concrete examples from the newsgroup to illustrate their point,
(3) their conclusions.

This assignment was one of four other small assignments during the two-semester course; a large research paper and electronic journals were also assessed.

Cluster Session (T29E)

Teen Rights: An Exploration of Constitutional Rights, State and Local Laws

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Keywords: telecommunications, curricular projects, constitutional rights

Abstract

Teen Rights is an integrated lesson designed to provide teens with an opportunity to examine an individual's rights in a framework of laws and Supreme Court cases. These cases can be related to the students' own age and experiences. Students research public attitudes toward teens and relate current attitudes to past decisions by the U.S. Supreme Court. Student groups act as the justices to write their ruling on each case. By participating in this simulation, students learn that the decisions of the U.S. Supreme

Court are situational and are seldom unanimous. A somewhat different set of facts or a new attitude by the Court might well lead to a different ruling tomorrow.

Objectives of Lesson:

1. All students will be actively involved in activities that promote an understanding of the basic rights and responsibilities of a citizen in the American legal system.
2. Cooperative learning will be used in a classroom setting to simulate the operation of a supreme court.
3. Students will be motivated to seek more justice from our courts and other instruments of government.
4. Students will use resources effectively to organize, synthesize, evaluate, and apply information.
5. Students will be involved in activities that require collaboration, communication, and problem solving.
6. A team teaching approach to curriculum integration will be used.

Hardware/Software Needed: computer, modem, com program

Telecommunication Resources Used: AT&T Learning Network and FIDO Net. Project can be done with other networks.

Importance (Role) of Telecommunications in This Plan: With fewer than four people per square mile, Wyoming is isolated from many of the problems associated with teens in more populous areas. By using telecommunications, students are able to learn firsthand about the problems teens in other geographic areas face. Through dialogue both groups clarify their attitudes, rights, and position in relationship to the law. Students will conclude that this can vary according to population, teen violence, and current local interpretation of the law.

Curriculum Areas Involved: Government, language arts, research, computer skills, mathematics, and telecommunications

Grade Levels: 11 and 12

Class Management Strategies: All of the students meet once a week to exchange information and discuss cases. In between, students work with members of their group to learn skills, and collect and organize their information. Students are organized in groups of nine to simulate the Supreme Court. Each group has members from government, technology, and applied mathematics classes (some students are in more than one of the classes). Within the group, members have the responsibility for teaching the technical and research skills they have to other members of the group.

A large amount of learning can take place in a short time by using peer tutoring. The technology students teach how to use the local BBSs. As data came in, the math students teach what they were learning about organizing and presenting information. Government students contribute more information about the laws.

All of the students in the group collect and present their share of the information, argue for their viewpoint, and collectively write the final decision on a case. In order to keep track of the large amount of information in a manner accessible to all the students, a file for each topic was established. The files contain raw data, student writings, and writings from other students in the AT&T Learning Network Circle. Files will be a resource for the final Learning Circle publication.

Printed Materials Needed: Copy of U.S. Constitution and copies of a variety of U.S. Supreme Court cases.

Procedures/Activities:

1. Students brainstorm "teen rights" issues and form groups to write questions concerning each issue. They then use AT&T Learning Network and FIDO Net forums: "Law and Disorder," "Ask A Cop2," "Young Adult," and "Kids" to ask their questions and get responses from a wide audience.
2. Teachers present information about the Constitution and students decide what Amendment each issue is related to.
3. Groups of nine students are formed to represent the structure of the Supreme Court. Each week a new Supreme Court case, representing one of the issues, is presented to the students. Students are asked to act as judges ruling on the case. They research the relevant laws and precedents then write their decision with their justifications.
4. At the same time, each court case is presented on the AT&T Learning Network for discussion and to gather input from other teens. The next week the actual ruling is given to the group, E-mailed to the other schools, and a new case is presented.
5. Students continue to use the FIDO Net forums to collect information.
6. Students evaluate the information they have gathered. Students reach conclusions about the gathered information.

Final reports are compiled in a publication for The Learning Circle.

Methods for Evaluating:

1. Students will be evaluated on their ability to justify their decision on a case, using the precedents set by cases they have studied, their knowledge of the Constitution, and the circumstances of the case. Justification will be in both written and verbal situations.
2. Students will be evaluated on their ability to collect information for a case from a variety of sources, organize it, and present it to their peers.
3. Given a situation from their own lives or that of a peer, students will give reasonable alternative behaviors for dealing with the legal system.

Cluster Session (T29F)
Picture This

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Keywords: telecommunications, curricular projects, art

Abstract

Students from schools around the world will each develop a written description of an actual landscape from their geographical location. They will also make a 9 x 12 pen and ink or pencil drawing of this same landscape, which will be sent only to the sponsoring school. The written descriptions will be sent via E-mail to all participating schools. The receiving schools will make their own 9 x 12 drawings from the written descriptions. The best drawings will be sent to the sponsoring school. These will be combined into a final project, which will then be mailed via parcel post to all participating schools.

Objective(s) of Lesson: Descriptive writing is an art. It helps the reader create vivid images in his or her mind. When you want to help others who do not have personal experience in a setting to understand the setting, you have to use the richness of language. The major objective of this project is to help students visually see the results of their writing. They will see the image that their words conveyed to students that live in distant locations. This should help students develop their descriptive writing skills. Students will use drawing concepts and techniques to interpret the written descriptions. Drawings from the various schools will be made into a publication, which will be shared with all participating schools so that they can compare and contrast students' artistic interpretations of descriptive writing. They may be able to see how regions differ in their ability to see different kinds of scenes.

Hardware/Software Needed: Computer to be used for word processing, computer with modem, dedicated phone line, word processing software to be used to attach to AT&T doftware

Telecommunication Resources Used: AT&T Learning Network

Importance (Role) of Telecommunications in This Plan:

1. Forces the students to use and improve written language skills
2. Instills a sense of cooperative learning in students

3. Shows the need for good descriptive writing
4. Students can become the "eyes" of their peers in far-off places
5. The computer screen becomes the artist's palette and telecommunications, the brush. The speed of telecommunications makes it possible for everyone to be working at the same time regardless of their location.

Curriculum Area(s) Involved: Art, language arts (written communication skills), computer science

Grade Level(s) Targeted: 5-12

Class Management Strategies: The students in each of the classrooms work as a team. It might be the whole class, a small group, or a single student representing the team on the network. The team contribution can be organized by the class and/or teacher to fit into their schedule.

Procedures/Activities: Lessons on telecommunication and function of modem; instructions on drawing concepts and techniques; lessons on word processing. The sponsoring school would ask each participating school to choose and write a detailed description of an actual landscape in their locale. Each student's description could be critiqued and the best could be combined into one. All students would also create their own drawing of this landscape, with the best being chosen for the final project. This drawing would be sent to only the sponsoring school to assure that the other students would not see it until they had made their own artistic interpretations. The written descriptions would be sent through the AT&T Learning Network to all circle schools. The receiving schools would then have their students draw the landscapes from the written descriptions. Again, the best drawing of each landscape would be chosen for the final project. The sponsoring school would combine all descriptions and drawings into a publication, which would be shared with all participating schools. Classes would then be able to compare all interpretations from the written descriptions with drawings made from physically being there.

Method(s) for Evaluating Student Achievement of Objective(s):

1. The students will be evaluated by comparing the participants' interpretations of their written descriptions.
2. Students' writing skills can be compared from beginning of project to end.
3. Students will also be evaluated as to their ability to work cooperatively with students from distant locations.
4. Students will be evaluated as to the accuracy of the completed project.

Cluster Session (T31)

Telecommunications in California Teacher Education Programs

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Keywords: Telecommunications, Teacher Education, Internet

Abstract

Telecommunications can provide the basis for a wonderful future or cause the gulfs between various parts of our society to widen. We describe the telecommunications components of the required computer courses and the telecommunications facilities offered at four teacher education programs in California. The conclusions from our examination show great disparity. The likely scenario is that there will be great inequities in the application of technology in education.

Introduction

Telecommunications can provide the basis for a wonderful future or it can cause the gulf between various parts of our society to widen. All children should have a right to a school equipped with multimedia, telecommunications, and teachers versed in the use of these materials. If this is not viewed as a right, the gaps in our social strata will widen. This right may be necessary, but can it be realized?

This question seems out of place among enthusiastic supporters of technology. Those who believe in the future benefits that will be made possible by new technologies will fight to achieve this right. But do all teachers and all teacher education programs hold this belief? In the face of funding shortages, struggles to provide the minimum needed for teaching, and the resignation that captures many teachers after years of hard work with no recognition, it is more likely that acceptance and dissemination of telecommunications will be forced on institutions from the outside (state legislatures or accrediting agencies) than grown from within.

The Possibilities

U.S. school districts spent more money on telecommunications-enabling technology — that is, networks, satellite dishes, and modems — than any other technology ("Update," 1993). A cursory examination of the proceedings from recent conferences demonstrates benefits from this family of technologies in four areas: tools for instruction, curriculum development, infrastructure of the educational system, and the emergence of a new form of communication for education.

Telecommunications technology provides tools for instruction in several subject areas. The obvious beneficiary of technology is mathematics. Edwards (1993) describes several telecommunications-based projects for math. There are applications for telecommunications in writing (Fowler, 1993; Grejda, 1992), science (Southworth and Moore, 1992), and social studies (Oehring, 1992; "Update," 1993).

Curriculum can be enhanced through technology (Drury and Kaufman, 1993) and taken in new directions (Kodet and White, 1993).

The infrastructure for education has been changed by telecommunications. For example, Internet now provides access to the Library of Congress. This means that the database of 26 million materials catalogued and held by the library are accessible at any school that maintains access to Internet (Wilson, 1993). Internet, in fact, provides a wide variety of services (Schaeffer & Olson, 1993), including many databases that can be accessed, queried, and therefore integrated into a plan of instruction (Caputo, 1992). A more widely discussed impact on the infrastructure of education is distance education. There are already examples of distance education providing a benefit in rural areas (Wess, 1993; "Update," 1993). There are even examples of benefits in urban areas, such as the Mass LearnPike (Foote & Lowd, 1993). Whatever one's views of distance education may be, it is clear that telecommunications has already provided an advantage that educators should be concerned about attaining.

Telecommunications provides new forms of communication. It enables all students, such as the students at the Florida School for the Deaf and the Blind ("Update,", 1993), to participate on an equal basis, and to work together without knowledge of one another's abilities, sex, or race (Brehm, 1993).

The benefits from telecommunications are so great that public figures are recognizing and describing a "right" to access Internet. Sobol (1993) states: "I believe Al Gore is right: To accommodate all the uses for which a free and democratic society needs a national electronic network, the network must be built by the federal government and managed for the benefit of all. It is as much a right for a citizen in this country to use such a national network as to breathe the air and walk the public streets."

The Disparities

A commonly recognized problem resulting from using technology in education is that unequal access creates "have" and "have not" groups (Kearsley and Lynch, 1992; Sobol, 1993). Access to technology is likely based upon students' socioeconomic status. Ravitch (1993) advocates that every school be wired for access to forms of educational technology through a mixture of federal, state, and private-sector policies and funds.

Advocacy groups have already formed to protect the interests of K-12 users on Internet, an international network of computer networks. These groups recognize that some schools don't even have sufficient electrical outlets (Hill, 1993).

The Legislation

State legislation in California, Iowa, Maine, South Dakota, and Texas mandates that teacher education programs provide coursework in computing (Tryneski, 1992).

The Case Studies

We interviewed the directors or associate directors of four teacher education programs in Southern California. Program A is at a private, regional, doctorate-granting institution. Program B is at a large, comprehensive state university. Programs C and D are at small, church-related universities that have large adult education programs.

Program A is part of a Center for Educational Studies. The center grants master's and doctorate degrees. This particular program provides fifth-year teacher education for people with a bachelor's degree in some academic discipline.

The course in Program A takes place during the second summer session each year. This makes for an intensive course and limits how much can be done. This institution views students as lifelong learners and expects them to engage in critical thinking. The institution has a constructionist philosophy where people learn at the point of learning. Therefore, the course is taught by current K-12 teachers in their actual computer labs. These labs are extremely wellequipped and have popular software. The requirements for the course are individual, and students do projects that are useful to them. There is a bottom-line set of activities, but the students may go beyond them, depending on their needs.

In our opinion, Program A provides the best telecommunications. This program formed a partnership with a local high school to provide extremely high-quality facilities. The required computer course was offered in the high school computer lab, which allowed teacher education students to see actual examples of a realistic and completely possible technology environment. Facilities were provided that proved a public high school could be on Internet, have multimedia, and provide high-quality learning experiences for students.

The California State University (CSU) system is required by statute to require computing for approval by the credentialing commission. The CSU system, in turn, requires each Cal State to include at least one computing course in the teacher education curriculum. Most of California's teachers, indeed, 10 percent of all teachers in the United States, have attended a Cal State (Kramer, 1991). Program B includes two courses for credit, a two-credit course and a four-credit course with a lab. The class size is limited to 20, which the director expects to be increased. Other courses do not require students to use computers, but papers in all courses must be typed. Therefore, most students use computers for word processing.

The computers available to students who are attempting to complete the state certification requirements for computer expertise include Apple IIEs, Apple IIGS, MAC II, MAC LC. There are also IBM PS2 Model 25s, a MAC SE , and a Quadra. There are lab hours for students to use the computers on their own. The School of Education is responsible for the lab. A faculty member acts as technical coordinator and gets release time. Two of the three labs have telecommunications capability. Program B has a Prodigy account. Instructors generally have students access the campus network to get to Internet.

Program B is an example of an inequitable situation. This program provided the best facilities that it could by itself. Budget problems left it with a site that was, at best, half complete. It was clear that students in this teacher education program would be resigned to accepting "less than the best" once they were in their own classrooms.

Program C uses a lab at an elementary school. The university does have two DOS-based labs, one with a Novell network, but the teacher ed program doesn't use the labs. The teacher ed program was establishing its own lab, but the computers were stolen. There are nine Apple IIs, four Apple IIGSs, and five Macintoshes in the university's learning resource center, which are available for students to use. The lab at the elementary school contains 15 LCII Macs connected to a dot matrix and a laser printer.

The course uses a demonstration method in which the professor does the activity on a computer attached to an overhead projector. Students are given handouts with step-by-step instructions because there is such a wide disparity in their skills. They work at their own speed under supervision. The director of Program C feels that everybody in class is excited and amazed by what they can do, but there is no funding for computing when they get back to their schools.

Program C shows the disparities that exist. Even though the students are using the same model as the successful Program A uses, the lab that they have access to does not provide telecommunications capabilities. It is a smaller school in a school district that is less well off than Program A's district.

Program D's teacher credential course is so packed with information that it becomes a survey course. As a result, the director feels students probably don't get what the state intended them to. The course tries to expose students to all the software available, i.e., drill and practice, simulation, tutorials, and instructional games. The programs are run on two platforms, Apple and Macintosh. The teacher education program is a big user of the university's academic computer center, which has over thirty Macintoshes and at least as many IBMs and some Apple IIEs. Program D also offers courses at off-campus sites, where computer labs are rented from local schools.

Most of the students in Program D are actual teachers. If they are teaching in a technologically covered school, then they know what is out there. Students teach in schools that run the full gambit from two Macintoshes that are locked in the principal's closet to model technology schools.

In addition to the computer course required for the California teacher credential, Program D offers a course in telecommunications. In this class, students access Frednet. There are lectures on, but not hands-on experience, with networks. Program D provides an example where the school is proactive with a course in telecommunications and the intentions are well thought out, but the implementation may vary depending on whether the student takes classes at the campus where the lab is well equipped or at sites where the kinds of computer facilities available are an unknown.

Conclusion

In our paper, we described the telecommunications components of the required computer course and the telecommunications facilities offered by these teacher education programs. The conclusions from our examination show great disparity. The likely scenario is that there will be great inequities in the application of technology in education. From our own experiences at conferences, such as ICTE and NECC, it seems likely that the only factor that has kept such inequities from becoming an overwhelming problem is the enthusiasm for the potential of these technologies by their proponents.

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Cluster Session (T32)

The Problems and Promises of Putting Associations On-line

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The panelists are members of the team that worked on ISTENet. Education associations such as ASCD, NCTE, and ISTE have experimented or are experimenting with ways to put their members on-line. We will talk about some of the problems and proposed solutions.

The National Council of Teachers of English (NCTE) and other literacy and humanities groups are carrying out a pilot project to see what kind of electronic network might be useful. As like-minded groups from K-12 and higher education gather on the same on-line system, we are confronted with several questions: How do you achieve the feeling of community that conferencing gives you, yet make the system open to people who want to use their "free" Internet accounts? If you let users "telnet" in and use conferencing, you soon have a bandwidth problem. We are exploring newsgroups and listservs as options. The service we are using in a pilot project now is developing a graphical user interface software so that newsgroups (available on many local systems) are more like threaded conferencing. We are letting focus groups try three ways of working on-line in groups. I will report on what these groups from NCTE think about these options, and how we have dealt with such problems as How do you provide equity and access for rural teachers? What features (such as file libraries and forums for teachers) do you provide? What is a fair price? How do you use Internet?

The Association for Supervision and Curriculum Development (ASCD) has established a small, private electronic conferencing system to which it would like to add value and convenience by establishing Internet connectivity. The association's budget does not have the funds to pay for connectivity, yet if the group begins to charge a membership fee, it may lose any chance to attract a critical mass of members. The dilemma is difficult to resolve, since the audience is not composed of sophisticated computer, not to mention bulletin board, users. Vicki Hancock will report on ASCD's network.

The International Society for Technology in Education (ISTE) went through the process of evaluating options several years ago. Some of the task force members wanted an on-line system with computer conferencing, but the organization found that using a commercial system did not work. Rather than try another network, they are having members who want to work electronically communicate through @Internet E-mail. Lynne Schrum or someone from the team that explored options for ISTENET will tell about that association's experiences.

Cluster Session (T33A)
"Can We Talk?...Preservice Teachers Get Their Heads Together"

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Abstract

Teacher education majors at Mississippi State University (MSU) have found gold in Texas — and they never left their seats! This session will focus on collaborative projects conducted between students at MSU and teachers (and their students) in Texas classrooms using the Internet as the telecommunications medium.

Preservice teacher education in the College of Education at Mississippi State University (MSU) has experienced a remarkable phenomenon that is breaking the mold of tradition. Students do a lot of talking-outside of class, during class, while the professor is talking, while their classmates are talking — whenever they desire. Furthermore, the individual(s) with whom they are talking may be thousands of miles away. An extra added bonus is that they don't have to worry about interrupting the professor! How, though, can all this talking be going on without disrupting class? How does this model conflict with tradition-seated teacher education programs?

Internet provides the answer. Preservice teachers are free to use the networked computers that are managed through the College of Education Instructional Technology Resources Center. Each computer is equipped with an Ethernet card and has direct connection to the Internet. Courses are taught and experiences are provided that empower students to initiate and maintain contacts with both preservice and inservice teachers around the country. As a regular part of learning activities in most courses, students access their "curriculum partners" to discuss topics being taught, research pertinent issues, and collaborate on special projects.

One example of a strong collaboration that is occurring is the dialogue between preservice teacher education majors at MSU and inservice teachers in Texas. Several teachers in Texas, using their TENET connections to the Internet, conduct daily, ongoing discussions on a wide variety of topics. Holly, a special education major at MSU has questions about dealing with peculiar behavior disorders exhibited by a special education student living in a dysfunctional family. She contacts Kathy, an elementary special education teacher in Beaumont, TX, who describes how she dealt with this situation as it happened in her classroom. This represents real, immediate, valid learning. Holly could not have gotten this information from a book — even if she had, it would not have meant as much to her!

Mark, a secondary physical education major was having severe difficulty adapting to the writing of meaningful, realistic behavioral objectives for his lesson plan portfolio. As a remedy, he received help from a physical education teacher in Houston who also referred Mark to another physical education teacher in the United Kingdom. As these conversations grew in frequency and length, Mark became a much stronger, more participative student in face-to-face classroom discussions. That kind of benefit is hard to measure in traditional terms.

Students in Mrs. Perkins' class in Texas wanted to have immediate feedback on careers they were studying. They used the Internet to pose their questions to students at MSU. The teacher education majors took great pride in responding to the junior high students and in offering them expertise through personal stories, recommendations of people to contact (on the Internet, by the way), and suggestions for further research. A by-product of this activity was that MSU students realized enhanced self-esteem because students in Texas had sought thein out and asked for their opinions.

Collaboration among teacher education majors at MSU and educators around the world has brought unparalleled relevance to students' preparation for teaching.

As this model continues to operate and grow as it is used, such activity will be considered a natural, expected part of teacher education.

Cluster Session (T33B)
Project TIE: Student Teachers and Telecomputing

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Keywords: telecomputing, telecommunications, student teaching, student teachers, E-mail

Abstract

Project TIE investigated the effectiveness of using telecomputing as a medium for instruction by student teachers. Ten student teachers from Bradley University, five elementary and five secondary, used FrEdMail to conduct collaborative learning activities among their classrooms. The student teachers became proficient at telecomputing and reacted positively to the experience.

Project TIE (Telecomputing in Education) is a vehicle for training Bradley University student teachers to use telecomputing as a medium to conduct collaborative learning activities.

The goals of Project TIE are to:

- equip student teachers with knowledge and skill in telecomputing
- conduct collaborative learning activities among K-12 classrooms
- facilitate professional interactions among student teachers
- improve the connection between community K-12 schools and Bradley University
- provide opportunities for inservice training for cooperating teachers
- strengthen student teacher links to Bradley University.

Method

Ten spring 1993 student teachers were selected to participate in Project TIE on the basis of their grade point average, field experience evaluations, and desire to integrate educational technology into their teaching. The five elementary student teachers taught at the second (3), fifth, and sixth grades, respectively. The five secondary teachers taught in the following fields: chemistry (2), English (2), and mathematics (1). The student teachers were placed in area schools with cooperating teachers who agreed to support the goals of the project. One of the secondary students withdrew from the project.

Student teachers took a seminar course taught by Dr. David McMullen and Dr. Daniel Keane designed to familiarize them with the telecomputing process, enable them to set up and use their computer systems, design suitable telecomputing projects, and use FrEdMail.

The student teachers were to conduct collaborative learning activities or projects among their classrooms using the guidelines suggested by Rogers, Andres, Jacks, & Clausen (1990). Each student teacher was to participate in two projects in addition to the mandatory Hello project. Student teachers were encouraged to work together to design the projects, which could be conducted either across grade levels or within grade level.

An example of cross-grade-level projects was "Ask the Expert." Students from elementary classrooms posed science questions to students in the secondary chemistry classrooms. Some of the questions were "Why do onions make your eyes hurt and tear?" "How does cream go from a liquid to somewhat solid when making butter?" and "Why does dynamite explode?"

A within-grade-level project was "The Adjective Project." Students in participating elementary classrooms exchanged lists of favorite adjectives with a partner. Then the students wrote stories using the adjectives they received, and the completed stories were exchanged.

Results

A debriefing session was held to evaluate the effectiveness of the project. Student teachers were asked to complete a 22-item survey about Project TIE. Their average responses on a five-point scale were as follows:

Content of Item(s)	Item(s)	Average Response
Comfortable working with computers	1&20	4.3
Knowledgeable of the telecommunications process	9&15	4.3
Easy to use a modem	12&19	4.5
Easy to use the FrEdMail System	8&16	4.3
Will use FrEdMail in future	3&10	4.6
Value of working with other teachers on FrEdMail	13&18	4.3
Able to obtain needed information using FrEdMail	6&11	4.0
FrEdMail was a valuable addition to class	2&4	3.6
Enjoyed using FrEdMail	5	4.2
Projects were valuable	7	4.2
Desire to continue working with		

telecomputing	14	4.3
Would like to set up a school's telecommunications system	17	3.8
Able to communicate effectively with others using E-mail	21	4.3
Met new people using FrEdMail	22	2.6

n=9
scale: 1 - strongly disagree, 2 - disagree, 3 - undecided, 4 - agree, 5 - strongly agree

All participants were positive about the personal and professional value of the experience. Their suggestions for improvement concerned improved training, greater cooperation from schools and teachers, modification of the projects, and the need for more reflective teaching.

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Cluster Session (T33C)

The Reflective Community: On-line Links Shape Collaboration in Teacher Education

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Keywords: writing, telecommunications, computer-mediated communications, teacher education

Abstract

A school district and faculty of education in British Columbia have operated a collaborative project that draws upon the resources of both to offer pre- and inservice programs in which practicing teachers are actively involved in the education of student

teachers. The project used computer conferencing to promote reflection through written interaction and develop collaborative learning partnerships.

The faculty of education at Simon Fraser University (SFU) in British Columbia views teacher education as a continuum. The Professional Development Program (PDP), in which student teacher candidates pursue teacher certification, is largely school-based, linking classes and resources at the university directly with students and their sponsor teachers in the practicum setting. This link is sustained at the university by faculty members, who work cooperatively with PDP program coordinators and "faculty associates" (FAs) to offer a unique blend of campus programs, practicum placements, and practicum supervision. FAs and coordinators are teachers who have been seconded from the field to the faculty for term appointments. FAs supervise student teachers in their practicum placements, as well as develop and offer campus-based experiences at the university in consultation with faculty members.

Beginning in 1990, the project undertook to reexamine earlier efforts to introduce telecommunications-based learning opportunities into the program. In rethinking how technology might be used to extend involvement in professional discussion and dialogue to the student teachers, the program concentrated on introducing them to computer conferencing as a reflective, language-based medium in which all participants could emerge as learners.

A Reflective Community: Validating the Learner's Perspective

Grunau and MacKinnon suggest that a teacher education program "has a great deal to do with the social structure among the various participants as the foundation for a number of 'forums of action and discourse,' in which the knowledge base of teaching gradually and continually develops through supported reflection," and that reflection is a function of "community and discourse" for student teachers within these multiple forums. They go on to discuss how student teachers might learn from each other by engaging one another in the "practice of teaching and the critical discourse surrounding their experiences" and declare that their assumptions that "knowledge about teaching is actively constructed by practitioners themselves, inextricably linked to their experiences and inquiries in actual situations of practice," lead them to construct their own view of teacher education programs as a "number of forums in which we might nurture and develop students' own expertise in taking on the role of the teacher."

Computer conferencing offers a platform for these forums in which student teachers may "take on the role of the teacher" reflectively, through written interaction with one another.

After a period of active use in which the student teachers considered with one another their developing notions about teaching, it became clear that this sense of community was nurtured by the control that the student teachers had over the technology — a control that demonstrated the value of their own reflections on action and how their notions could be validated within the learning context of their program.

Over the course of the first semester, the student teachers began to utilize the on-line link from their schools to review their experiences during each week of their placements. Where particular issues declared themselves, new, more focused discussions began to flourish.

As the students' ability to implement the technology increased, deeper, richer understandings began to appear in discussions, along with an increased interest in the mechanics of their own learning in the on-line environment.

Later in the first term, study groups began, responding to particular interests of the student teachers.

Continuing the Work

The faculty of education at York University in Toronto is developing this approach and adapting it to the university's preservice program, a three-year concurrent model.

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Cluster Session (T34A)

Highways in the Sky: Reaching Migrant Students through Distance Education

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Keywords: distance learning, migrant education, equity, TI-IN Network

Abstract

During the 1993 summer, school-aged migrant students accessed instructional opportunities regardless of their summer living arrangements or travel patterns via special broadcasts on TI-IN Network. Project SMART (Summer Migrants Access Resources through Technology) bridged the gap between school terms and provided stimulating learning experiences for students in nine different states. Focusing on four different instructional levels, this multi-state project made significant progress toward building greater equity for the migrant student population.

Summer Migrants Access Resources through Technology (SMART) Project Goals

- To provide quality instructional support to migrant students remaining in Texas who were not being served in summer programs because of employment patterns, lack of availability, or distance
- To provide continuity of instruction for Texas migrant students who lived temporarily in other states or who moved within Texas during the project period
- To improve performance on math-problem-solving sections of the Texas Assessment of Academic Skills (TAAS)
- To demonstrate the applicability of distance learning for meeting the needs of migrant students

SMART: Participants

As a multi-state project, SMART served students in designated migrant school programs in California, Colorado, Illinois, Michigan, Montana, Pennsylvania, Texas, Washington, and Wisconsin. As a project of the Texas Education Agency, SMART served identified migrant students and schools in Texas. School districts in the Education Service Center, Region 1 and Region 20 areas of South Texas and the Rio Grande Valley, were active and highly significant participants.

SMART: Instructional Design

Project SMART instruction was delivered in two ways.

Televised Instruction: Live, interactive televised lessons and instructional materials were provided by TI-IN Network and Education Service Center, Region 20 in San Antonio, from June 8 through August 19, 1993. Addressing four instructional levels, the instructional design focused on development of problem-solving math skills. Other developmental and curriculum subjects were integrated into the classes. Instructional levels were early elementary, elementary, middle school, and high school. Three half-hour lessons were broadcast to early elementary, elementary, and middle school students each week for eleven weeks. Secondary students participated in a credit-bearing course called Mathematics of Money (MOM). The television portion of the MOM class consisted of two one-hour sessions during two evenings. Students showing mastery of the essential elements in this class earned 1/2 credit in Texas.

All of the live, interactive televised instruction was built around migrant students' homes, families, and community experiences. Lessons were crafted and designed for relevancy to the students' daily experiences. Materials and resources easily available to the students were used as centers of suggested follow-up activities.

Local Instruction and Support: A second integral component of instruction involved local teachers, called SMART Partners, employed by summer migrant programs. For students remaining in Texas the SMART Partner was frequently a home-based teacher, interacting with students in their homes. In the out-of-state programs, SMART Partners supported the televised instruction in summer school programs which were school-based.

Both school-based and home-based SMART Partners monitored progress, assessed student achievement, implemented additional instruction, and shared ideas with the television teacher via a toll-free telephone number. SMART Partners were critical team members as they provided the face-to-face interactions necessary to build self-esteem and implement activities.

SMART: Rationale

It is generally recognized that one of the chief detriments to student success among the children of migrant workers in the United States is the lack of instructional continuity. Moving from state to state and changing schools frequently result in mixed and confusing curriculum requirements. The resulting pattern is poorly coordinated educational opportunities for this population. Nationally available distance learning offers tremendous potential in resolving this educational dilemma. A future vision is for students who move from school to school to continue receiving the same class from the same teacher via distance learning.

In Texas, large numbers of migrant students historically have not participated in any kind of summer program. A 1992 needs assessment revealed that migrant students who travel out of state appear to perform at a higher level academically than students who are home-based or travel within Texas. Because of this alarming fact, the SMART model for in-state students was developed.

Students living temporarily in participating summer migrant programs also had access to the SMART classes. SMART Partners outside of Texas were in schools and centers that offered service to this population during the summer. Students who returned to Texas before the end of the summer resumed the same classes at home.

Cluster Session (T34B)

Breaking the Rules: Teaching and Learning Mathematics by Telephone

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Keywords: distance learning, mathematics, constructivism, audioconference

Abstract

The project described in this paper was developed for Texas migrant students as a means by which such students can receive academic credit for Algebra 1A during the summer months. The course was developed for and is delivered by audio-based distance education. A description of the development, delivery, and results of the pilot for this program is included in the paper and presentation.

The University of Texas at Austin TeleLearning Center

The University of Texas at Austin TeleLearning Center (UTTLC) has been involved in distance education since 1981. One of the unique aspects of the programs offered by the UTTLC is that they are all live, audio-based programs. Garrison (1989) points out that "the high level of interaction made possible with a relatively simple and cost effective medium such as audio teleconferencing clearly maximizes communication" (p. 69).

The nontraditional design issues had to be considered. Through careful design and development, this course and its accompanying materials facilitate the learner and encourage learning.

In addition to tailoring this course to the migrant student population, the instructor/author incorporated a constructivist approach. A constructivist mathematics classroom is one in which an interpretation of mathematical meaning is constructed by the learner and not imparted by the teacher. According to constructivism theory, all knowledge is a product of our cognitive acts (Confrey 1990). Students have to construct their own knowledge — individually and collectively.

Delivery of the Algebra Course

Algebra IA, which is the first semester of the algebra course, was taught for the first time during the summer of 1992 to a group of high school migrant students at Texas A&I University in Kingsville, Texas. Thirteen students from South Texas migrant families completed the four-week telelearning course.

The students, who were provided a structured and supportive environment, arrived at their classroom each day by 7:30 a.m. and were connected with their instructor during the next four hours. With four microphones placed around the work tables, the students were easily able to ask questions of their instructor. As a result, the teleconference portions of the class became highly interactive. Based on evaluation instruments completed by the students, the interaction obtained by audioconference contributed to the success of the course.

Results

The pilot program proved to be a viable alternative to face-to-face instruction, particularly considering that most of the students had taken algebra before and had failed the course. The final class grade average of 88 percent, with all students passing the course, supports this theory. At least as important as the final course score for the migrant students during the pilot project was their taking advantage of the opportunity to participate actively in mathematical reasoning and communication.

During the summer of 1993, the *Algebra Across the Wire* program was offered to 36 Texas migrant students in Laredo, McAllen, and El Paso, Texas, and Greeley, Colorado. Out of the 36 students who enrolled in the course, 33 passed, 2 dropped out, and one failed to pass. It should be noted that the student who was not successful was Limited English Proficient (LEP) and was unable to work with a translator during effectively class time. The overall final grade average for the four sections of the course was 92 percent.

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Cluster Session (T34C)

Accessing Telematics Networks for Users with Special Needs

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Keywords: access, overcoming of barriers, education, disability, telematics networks

Abstract

Access to telematics networks and computer aid both real and simulated mobility are the main topics of research and development of the Iberoamerican project under the auspices of CYTED — "New Information Technologies for the Personal Autonomy of the Disabled" — involving nine countries of the field. In this present paper are surveyed advances concerning the overcoming of barriers for access to telematics networks by means of peripheral emulations and use of interfaces which include multimedia software, graphical systems, and devices for computer aids for both real and simulated mobility for people with motor and sensory disability.

Introduction

The problem of human computer interaction (HCI) is profoundly changing concepts in the area of communication technologies. HCI suggests relevant challenges to be examined within the area of technical aids for the education of the disabled.

Accessing telematics networks and mobility are the two main elements to take into account when designing devices for education in the field of cognitive and socio-affective domains of children with severe motor and/or sensory challenges influencing their ability to utter a sound or word.

The design of systems for overcoming barriers to terminal access has been carried out by a multidisciplinary working team and includes the emulation of systems and the implementation of devices which allow the creation of virtual and real spaces where the teaching process in being carried out through a user-oriented technology.

For this purpose, therapists, teachers and engineers from Argentina, Brazil, Chile, Colombia, Cuba, Paraguay, Uruguay, Portugal, and Spain are joining efforts in a project started in January 1992.

Communication

The overcoming of barriers for telematics network access based on the user's special needs should allow through the use of the simplest and possible system — i.e., a unique binary input — the creation of the same effect as the one produced by the standard access system. At the same time it must provide the user all access possibilities to information available for the network user in a friendly and easy way by the use of software devices and resources.

The keyboard simulator ST based on a standard screen scanning system is the first element of our general system for access to the resources available in the telematics networks. This system also includes other elements to correct errors caused by unintentional movements by means of delete, backwards, and navigation functions, which are very common among users with motor disabilities. The system offers a friendly and ergonomic environment (unnecessary strokes are eliminated) based on transparent systems to facilitate access to standard software by using resident software.

The creation of interaction modules which permit linking the keyboard emulator ST and the resources available in the network, make a second working level, referred to as "Access System to the System Resources" (SASE). At the moment the new system includes ergonomics keyboard layout with several versions according to the frequency of Spanish and Portuguese letters as well as other elements such as word prediction.

ST has been produced in DOS and WINDOWS versions and it is currently being worked on the editing of user manuals suitable for each type of disability and sociocultural background. The screen simulation of three-dimensional movement is now inspiring the production of new software tools in the fields: mouse emulators and hypermedia designed for the motor and sensory handicapped.

In the area of mouse emulators, two prototypes have already been produced, on both DOS and Windows platforms. These two emulators include facilities for movement in a three-dimensional space simulated on the screen. The detailed description of it is to be presented in a paper under elaboration. Our systems based on object-oriented design (OOD) incorporate windows, icons, menus, and pointers (WIMP) to provide the user with all the elements needed with the possibility of integrating the elements in a strategy designed to be a modular system based on the user instead of the computer.

Structured and dynamic graphics systems are part of our research work, which is currently developing the production of editors and systems as the bases to incorporate animation to the already standard systems of augmentative and alternative communication (AAC) such as Bliss and SPC.

The design of hypermedia as an AAC system for the blind is now under research, and there is a prototype of a Hypermedia system based on sounds depending on the space configuration as well as the user's perception.

The prototype uses as a metaphor a building in which an imaginary navigation takes place which allows blind persons to explore nodes configured in rooms arranged in several floors.

Education

Basically centered on constructist educative processes, our approach also aims at emphasizing those aspects that encourage the persons' creativity and their better disposition for communication and mobility. This is achieved by stressing the importance of user-centered systems in the multidisciplinary design. Thus, it incorporates in a natural way those ergonomic aspects adapted to the needs for harmonious and complete development of the users who find in their handicap the particular way of educative communication in accordance to their development as autonomous and happy persons.

Special Education versus Education

To conclude we might approach the idea that aided education through telematics networks should be dealt with in a renewed context where the users become the actual and main characters in a process of teaching service based, from a technical point of view, on the user and on special education for the rest.

Final Remarks

We set aside in this teleteaching context other elements of our project, such as the development of sensory systems to help the blind persons' mobility, which are an outstanding aspect in our research and which will be the topic of future presentations.

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Cluster Session (T35A)

Intercultural Issues in Educational Telecommunications: The ORT Israel Experience

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Keywords: telecommunications, cross-cultural, Israel, I*EARN, ORT

Abstract:

The dramatic political changes in the world of the ninties and the realization of the global village make it necessary for teachers and students using international telecommunications to provide for cross-cultural challenges. Preparing for a new Middle East and training its students to cope with the future workplace, ORT Israel researches the implications while initiating Israel's largest educational telecom network.

ORT Israel is the largest management system for secondary and post-secondary educational institutes in Israel. It is part of ORT, the world's largest training network.

Students, teachers, administrators, and decisionmakers at ORT schools in Israel are experimenting toward what will be the country's largest telecommunication system.

As part of its feasibility studies and designing pedagogical objectives for its network ORT Israel has, for the past three years, encouraged collaborative learning projects between its students in Israel and students in other countries.

The projects are based on the activities of the International Education and Resources Network (I*EARN) initiated under the financing of the New York State-based Copen Family Fund.

One of the major advantages for students in using telecommunications at school was, as we perceived it, the simulation it would pose of the future workplace.

One of the more important challenges in simulating a global village workplace is the need to bridge inter- and cross-cultural gaps. With the drastic changes taking place in the Middle East, and the imminent need for people of different cultures to work together on shaping their future, the experience that ORT gained in bridging these differences provides us with up-to-date tools to tackle future challenges.

This paper will study certain facets of the cross-cultural challenges. Several examples are included. The presentation, to be made at Tel-Ed, will supply and discuss some of the solutions.

The global scope of I*EARN enfolds an interesting array of cultural cross-sections. The Far East is represented by the Peoples Republic of China, the Near East by Israel. Anglo representation is fulfilled by the U.S., Australia, and Canada, while Spain and Argentina depict Latin cultures. Ex-Soviet Russia is the East European representative, and West Europe includes The Netherlands.

Among the aforementioned countries, many have immigrant communities. Others have acute ethnic diversity, while still others, have dominant ethnic minorities.

We have north, east, west, and south hemisphere representation, as well as varying political regimes. This colorful puzzle holds great potential for treatment and promotion of intercultural understanding.

Even within the ORT Israel center of I*EARN, cultural diversity exists. Rural towns and large cities, agricultural and urban communities all have representing schools. Alongside Jewish schools there is also an Arab school and a Druze representative.

The intercultural issues of such international cooperation pop up both directly and indirectly. Here are some examples:

For over two years, I*EARN has been holding a support project to finance rope pumps for villages in Nicaragua, helping to eliminate water contamination and disease. This Boston initiative has held much local interest and was echoed in many of our North American schools. Very few of the sites outside the U.S. and Canada ever responded.

Last year three parallel relief projects were proposed: one for the victims of the hurricane Andrew in Florida, one for the starving people of Somalia, and one for the suffering in Bosnia. There was an influx of communications from the U.S. for Dade County, a strong European initiative for Bosnia, yet almost nothing for Somalia.

An ORT high school in Karmiel, Israel, collaborated with two Spanish schools on text study relating to the quincentennial of the expulsion of Jews from Spain. Besides the cultural issues raised in the main debate, the students in Barcelona got hold of a newspaper clipping relating to a decision made in Israel by a Sepharadic rabbi allowing animals to carry out tasks on the Sabbath that are forbidden to humans. An intense discussion was held as to both the religious aspects and, more so, the term "Sepharadi" in Judaism.

During the war in the Persian Gulf, I*EARN held an open electronic conference. Evidently, many of the North American students hadonly a vague concept of what a dictatorship is all about. The Israelis found it difficult to present their side of the picture because their American partners could not believe that a leader could act the way Saddam Hussein did.

Several I*EARN schools are now working on a collaborative Holocaust study project. During curriculum preparations for this project, which were done together by Israeli and American teachers, Jewish and non-Jewish, cultural discrepancies in the perception of the Holocaust were clearly present.

Most of the projects on I*EARN demand international teacher collaboration. Terms such as "commitment" and "punctuality" find different interpretations with different country representatives, as do manners of correspondence, curricular structuring aspects, etc. In project proposals, the quasi-administrative aspects bear the cultural stamp of their writer.

Cluster Session (T35B)

A Flexible Software Architecture for a Wide Area Educational Network

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Keywords: multimedia, network, education, developing, software, public, primary

Abstract

This paper describes how, using a user-friendly computer interface, an easy-to-expand network architecture, and a monitorable environment, the Chilean Ministry of Education is studying how to use computers and telecommunication technologies as change agents to make primary schools more attractive and effective places.

Here we present the main concept underlying an educational project for elementary schools in Chile. The project's design has considered the knowledge about the people and schools that will use the technology, the reported worldwide experience of computers and telecommunications in schools of the last decade, and the new opportunities of modern technologies — mainly multimedia, telecommunications and friendly. Here we will present the main concepts underlying an educational project for human interfaces.

The project's objective is to gradually build a computer-based communication network with 100 Chilean primary schools over the next five years. This project is a prototype that will allow the estimation of the educational and technical requirements for a later expansion to the entire Chilean educational system.

In order to achieve these objectives, the design of the project has considered the following key technical aspects:

Software usability

In order to require a minimum of end-user training, and to offer students and teachers an easy-to-use communication environment, there great effort is being put into the design of a user-friendly software and communications platform; teachers and students interact with the computer through a familiar and intuitive working place called La Plaza (Figure 1), which allows them to start communicating and working with the available software after a training period of less than one hour, which includes a short demonstration and hands-on practice.

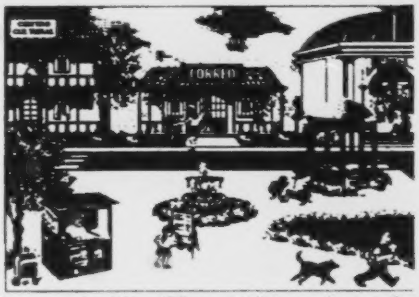

Figure 1. "La Plaza" User Interface

Availability of Information for Monitoring Activities

The system allows for the addition and adjustment of network administration and project monitoring components; both network administrators and educational project leaders inside the network can gather useful statistics to track the amount and evolution of traffic in general or of specific collaborative projects among schools.

Network Expandability

Since the experience with 100 schools should be replicable over the whole educational system, there is a flexible architecture which permits a gradual expansion of the network.

The network started as a prototype in 1991 and it now comprises seven nodes in Chile: six primary schools and the Catholic University of Chile, which is the central node. It is also connected via Internet to three foreign schools, in the USA, Argentina, and Spain. In 1993, the network will include at least thirteen nodes in Santiago, fifteen nodes in the southern city of Temuco, and several other foreign nodes.

The project's implementation is based on two "Educational Technology" Laboratories, one in Santiago and one in Temuco at La Frontera university, to support, design, and simulate the activities that will be carried on through the network. These laboratories have the resources, the people, and the equipment to build and test multimedia educational software. They are staffed by an interdisciplinary team, comprising software and telecommunication engineers, teachers, psychologists, and graphic designers.

This initiative is sponsored by the Chilean Ministry of Education and the World Bank, and it is the first official project in computers in education in Chile. The project emphasizes the use of computers as a means for making the schools a more attractive and effective place, particularly in poor and isolated areas.

Cluster Session (T36A)

Telecommunications in Second-Language Learning: Put a Star in Your Classroom!

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Keywords: telecommunications, second-language learning, E-mail, communicative approach

Abstract

The emphasis on language learning has shifted markedly in recent years to that of the "communicative" approach, emphasizing meaningful language use and practice. Telecommunications assists in providing for this emphasis. By utilizing a national low-cost commercial telecommunication package, effective motivating projects can be established which provide nearly all the benefits of more expensive international communications. One such telecommunications package is PRODIGY. It is affordable, useable for multiple languages, and user-friendly, and it allows unlimited on-line time.

All over our country and internationally, telecommunications technology is being used by visionary teachers who have found a compelling reason to integrate it into their curriculum. Certainly there is no more appropriate place for communication to take place than in a second-language learning environment, where the communicative approach to language learning is a primary goal. Telecommunications empowers the second-language learner with a new and exciting kit of learning tools, provides a real-life experience, and lends relevance to foreign-language learning. Thoughtfully designed lessons contain all the requirements of the major goals in language learning and embrace the primary goal: communication. The emphasis on language learning has shifted markedly in recent years to that of the "communicative" approach, emphasizing meaningful language use and practice. Telecommunications assists in providing for this emphasis. By utilizing national low-cost commercial telecommunication packages, effective motivating projects can be established which provide nearly all the benefits of more expensive international communications. One such telecommunications package is PRODIGY. It is affordable, useable for multiple languages, user-friendly, and allows unlimited on-line time. As a Spanish, French, and ESOL (English to Speakers of other Languages) teacher, I have used PRODIGY in each of those curriculum areas, sometimes using the electronic mail feature only, while other times using the more than 800 features available on PRODIGY for students to access and process cultural-based information. The PRODIGY service is available for the Apple Macintosh line as well as IBM and IBM-compatible computers.

Using Electronic Mail (E-mail)

The E-mail feature on PRODIGY allows members to send private electronic mail to other PRODIGY users. Once you have established a teacher contact in any of the 48 contiguous states, you can begin to establish parameters for your electronic mail project, as well as do E-mail lesson planning. As you are preparing goals and objectives, you can simultaneously prepare your students to use the PRODIGY software as well as teach some E-mail ethics.

E-mail Goals for Second-Language Learning

Some E-mail goals in second-language learning might include the following: Students will become telecommunications literate and will understand the overall use of telecommunications in our society, its applications in daily life, and how to access information and send information. The students will communicate with other students in the United States in their target language, at their level, and increase cultural awareness and understanding by discussing and comparing differences and similarities in their respective cultures.

Topics

The following are some topics which would be considered acceptable at the middle school or high school level:

1. School, including ethnicity, population, programs, location, traditions, school colors, clubs, organizations, sports, and leisure-time activities
2. Community, including climate, location, special events, hobbies, lifestyles, houses, entertainment, teen problems in the community. These are topics consistent with our state and local objectives, but they become increasingly relevant to students when they are actively involved with other students via telecommunications.

Activities

To initiate letters to your matched school or class, you might consider using whole-class brainstorming techniques which serve to generate vocabulary and conversation in the target language. After this activity, it worked well for my classes to break into small groups. These activities provide an excellent source of motivation for students to use in thinking, organizing, speaking, listening, and writing in the target language.

E-mail Project Student Evaluation

Teachers involved in the project should define the means by which students will be evaluated on their participation in the E-mail projects, then inform the students of the procedure before the onset of the project.

Program Evaluation

In my project, students from both schools soon learned that through the medium of telecommunications, they felt free to talk about differences and similarities, and each group expressed surprise in learning about their new on-line classmates. The curiosities expressed were wholesome and honestly stated. Much of the merit and success of the project was measured in the response from the teachers, who were willing to communicate during the summer and make plans to continue our telecommunications project in the fall. The doors of our classrooms opened as students and teachers passed electronically into each other's classrooms, closing the gap of miles, crossing cultural barriers, and discovering the utility of second-language learning. We witnessed an exchange of information utilizing the target language that we had never been able to accomplish with our textbooks. We were rewarded by a curiosity in our students to learn more vocabulary to express their ideas more adequately, and an intensity to send grammatically correct letters to their electronic classmates.

Culturally Based Research Projects

PRODIGY has many features that allow students to access information to enhance cultural awareness and understanding. Your students can research culture, history, and literature for the target language.

Conclusion

I continue to marvel at how using telecommunications in the classroom has changed my way of teaching and altered my students' perceptions about the utility of learning a second language. They now find relevance in learning, because they attach that meaning to their communicative competence with their new language. In addition, cultural understanding and awareness are enhanced while students acquire marketable skills: a second language and telecommunication literacy.

Cluster Session (T36C)

Telecooperation and Computer-Supported Cooperative Work

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Keywords: collaborative learning, cooperative learning, telecommunication, telecooperation

Abstract

The presentation summarizes the author's observations of various classroom activities using collaborative groups in which students communicated over distances using telecommunications technology. The projects used computers and modems to provide students with the opportunity to work together from remote locations. Pupils in different schools were grouped together and given problems to solve collectively.

Advice is offered to educators on how to implement telecommunications in the classroom to support collaborative student work.

Much has been written lately commending the virtues of cooperative and group learning in classroom settings. Educators cite advantages such as shared student leadership, positive interdependence and individual accountability, emphasis on process as well as task, social skills training, and freedom for the teacher to become observer/facilitator, to name but a few. The use of telecommunications in cooperative work expands the scope of the learning milieu while maintaining virtually all of the benefits of having students work together. The following provides advice to educators considering the implementation of telecommunications to enhance a cooperative work environment.

Establish Contact

Assuming you have the proper equipment, software, and expertise, establish contact! This can be done in a variety of ways, ranging from participation in a local school district's electronic bulletin board to monitoring and joining existing "conversations" on an established network such as the Internet. If you are unsure how to begin, seek help from consultants, teachers, students, parents, or members of your local business community. Computer-oriented periodicals for educators (such as ISTE's *The Computing Teacher*) often provide contacts and telephone numbers of networks or bulletin boards.

Keep in mind that the technology is only a means of establishing your goal of having students work together over long distances. Ideally, it should be transparent and easy to use. If you enjoy the challenge of using the hardware and software, go to it! If not, seek assistance from others. In some schools, computer studies students can earn part of their course credit by assisting teachers with the use of technology. They can provide a service by collecting, sending, and distributing your electronic correspondence.

Start Small

Initially it would be wise to establish a working relationship with one teacher in another school with a class whose curriculum is similar to yours.

Guidelines

Use voice telephone (if convenient), and/or E-mail to share descriptions of your classes, curricula, hardware and software, and timetables. Discuss common elements of your courses and possible projects. Agree upon some specific rules or guidelines regarding acceptable language and etiquette. There are substantial benefits to giving students ownership in this area by assigning them this task as their first collaborative project; however, it will help if both of you have agreed on guidelines in advance. Also, determine the anticipated frequency of mailings.

Objectives

Be specific regarding what each of you wishes to accomplish through this exercise. Include in your discussion a tentative plan on how the students' work (and yours?) might be evaluated.

Use Various Media

In addition to telecommunications, use a variety of other communications media, including voice telephone conversations, ordinary letter mail ("snailmail"), photographs (faxed or mailed), and especially videotape. Allow students to get to know one another by recording groups at work in each school, then sending it back and forth in the mail as the projects progress. The videotape will provide a dynamic, cumulative journal of activities, opinions, and information.

Mini-Resumes

As a starting point to getting acquainted, design a simple form for students to post mini-resumes to one another. These should include personal interests such as favorite musical groups, sports, etc., as well as curriculum-related opinions or areas of concern. The mini-resumes may also be shared among classmates to help establish groups with common (or diverse) interests or goals.

Document and File Sharing

Decide on the technical format of your electronically shared documents. (For example, will you be sending simple ASCII text? WordPerfect format? LOTUS?) Ideally, you will want to be able to send and receive a file without having to re-key the data each time. Students in one class can create a project work file and "mail" it to the companion school. Group partners then analyze the work, suggest and key modifications, and re-mail the revision to their counterparts in the first school. As long as both schools are using compatible software, the project can be improved and grow with each mailing. Currently, there are several ways of mailing files, depending on the equipment and network being used. Documents which are shared using the computer retain all of their special computer codes and are not simply copies of textual material. This means that students may modify the work without having to retype the information. For example, an electronic spreadsheet shared between groups can be received and modified with data and imbedded formulas undisturbed electronically in the sheet. The ability to receive, modify, and return a dynamic computer work file offers a substantial advantage over simple text files or static media such as hardcopy printouts, photocopies, or faxes.

Establish Groups

Have two students from each school linked electronically to form a group of four. Exercise your judgment as to whether you select the group members yourself, or allow the students to do so. Generally, students feel greater ownership of their work if allowed to select their partners. This has greater chance of success if you have done some collaborative work locally in your classroom prior to expanding into computer use.

Select Projects

Establish work projects for each group, and state the objectives clearly, just as you would when working solely with your own class. Ideally, students create their own problems to solve, along with the criteria for evaluation. Also agree upon timelines for sending and receiving project materials. If your return E-mail will be unduly delayed, send a brief message to the other school to avoid disappointment and frustration.

Assessment

Remember the benefits of assessment of the process as well as the projects by having students and teachers evaluate and offer recommendations for future long-distance group work. Teachers may want to collaborate on grading projects, assigning the same mark to all four group members.

Summary

The impact on students (and teachers) extends beyond the benefits of acquiring the content, knowledge, and skills associated with the projects. Participants should be encouraged to analyze the process of communication, and learn to understand and appreciate people's similarities and differences. Points of view on many issues vary (especially in areas of interest in which regional differences such as geography or politics play a part). Students learn to use modern devices to communicate with others who live in a different environment and to value others' opinions. Since this technique can be used in any subject area, and at any age or grade level, it has the potential to revolutionize the ways in which we learn and communicate with one another. In addition, it helps students and teachers to learn how to use modern technology to share ideas and knowledge - an ability which is certain to become a necessity in the future.

Cluster Session (T37A)

Distance Education and Computer Conferencing in DoDDS

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Keywords: computer conferencing, cooperative learning, asynchronous communications, global education

Abstract

The Department of Defense Dependents Schools (DoDDS) has been using computer conferencing as the backbone for its distance education course offerings for the past seven years. In that time, a highly interactive, cooperative learning "classroom" setting has evolved. The use of computer conferencing and cooperative learning techniques has added much to the education of DoDDS students worldwide.

The Department of Defense Dependents Schools (DoDDS) faces a big challenge in the coming years. With the draw down of military forces overseas, many DoDDS schools' enrollments will shrink, making it difficult to offer the wide scope of courses currently offered. DoDDS has turned to distance education to offer some of the courses which do not have a large enrollment but are important to our curriculum.

A unique challenge has faced our school system: how to offer quality courses to 224 schools in 19 countries in 7 different time zones throughout the world. DoDDS has chosen to offer courses at a distance through a computer conferencing medium. By basing our courses on a model that utilizes videotapes, textbooks, tests, and structured assignments, while adding to it the ability to work with the teacher and other students through computer conferencing, we have been able to offer courses to more than 700 students since 1986. Currently, DoDDS offers five courses "via Telecommunications:" Pascal, Advanced Placement (AP) Pascal, AP Calculus, AP German, and the Scientific Research Seminar (with a total enrollment of approximately 170 students).

The courses are structured much like a normal classroom. Students are placed in a conference of 10 to 25 students and work together with one teacher and with one another. A critical component of this structure is the ability of the students to work together in cooperative work groups. In the Pascal courses, students are assigned to two different groups each semester. One group is composed of students in the same geographic location. These students are assigned local group projects (LGP), working together cooperatively and sending in a common assignment. In this way, students are able to help one another learn new concepts since, in many cases, an expert teacher may not be readily available to them at the local site. The second group is composed of students who are separated by time and/or geographic location. There are several projects throughout the year in which these groups help put together a class project, generally a computer program. Through the use of cooperative learning strategies, the students are gaining valuable experience in what it is like to develop and complete a project in the real world.

We have found that courses taught in this way have many secondary benefits for our students. Most of the students learn to be self-directed learners. A great deal of responsibility is placed on their shoulders. They are, of course, encouraged by the distant teacher and the local facilitator, but they ultimately must learn to develop a work schedule, find resources outside of the classroom, work together in a group, and use their time wisely. The teachers and facilitators are constantly working with the students to help them develop these skills. Secondly, the students naturally become better writers and readers. Since all of the group projects are conducted in the computer conferencing environment, the students are forced to communicate in the written mode. They learn quickly that they must read carefully the instructions given to them and that their own contributions must be clearly written. Since all communication is done synchronously, the students have plenty of time to compose their discussions off-line. Thirdly, students learn to work in a group setting. Many of the assignments are based on cooperative learning (but with individual accountability). The students learn to help one another and to ask for help from their peers, skills which will serve them well in the workplace of tomorrow.

DoDDS use of computer conferencing is now being introduced into the regular classroom. Through the use of computer conferencing, DoDDS plans to enrich current course offerings for students throughout the system. Students in some AP English and journalism classes are now able to work together in a computer conferencing environment.

Plans are underway to introduce the use of audiographics into our current distance education course offerings. This will also be used to form cooperative work groups where students will be able to interact in real time as well as through computer conferencing. Two DoDDS physics teachers are currently developing an AP physics course which will rely heavily on the audiographics and computer conferencing environments.

DoDDS has demonstrated that computer conferencing can be used successfully in the seventh- through twelfth-grade arena. Seven years of experience has taught us much about the delivery of our distance learning offerings. We believe that the ability of students to work together in cooperative learning groups using current telecommunications technology has significantly enriched the distance learning environment. Our distance education students feel that they belong to a classroom of students located around the world. We feel the use of cooperative learning through computer conferencing at the high school and junior highs school level should be a component of courses taught at a distance.

Cluster Session (T37B)

The Affect of Interaction on Achievement, and Attitude in an ITV Distance Education Class

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Keywords: interaction, interactive television, achievement, distance education

Abstract

Learning at a distance, whereby student and instructor are separated, adds a new dimension to the instructional component of communication. This study reviewed the affects and limitations of the Interactive Television (ITV) medium as it pertains to an analytical chemistry course. In particular the study evaluated not only students' attitudes toward ITV and their academic achievements but also the focus of both the method of instruction and the communication apprehensions.

Introduction

Transfer of information from an instructor to a student is called instruction, and because this transfer depends on assimilation of new material, effective instruction cannot take place without communication. Learning at a distance, whereby instructor and student are separated, adds a new dimension to the instructional component of communication. Unfortunately, choice of media and the elements of time and distance restrict the flow of communication from instructor to student. A potential answer to the communication limitations appears to be Interactive Television (ITV).

As a means of transmitting instruction, ITV has been successful. Students learn academics well in electronic classrooms. Yet despite the documented success of ITV, little research has been done on the effects of the medium on interaction, achievement, and attitude. This paper will review the effects and limitations of the ITV medium as it pertains to an analytical chemistry class. In particular, this study will evaluate not only the student attitudes towards ITV and their academic achievements but also the focus of both the method of instruction and the communication apprehensions.

Hypotheses

1. Students who participate in verbal interactions with teachers or peers through the use of the desktop microphone will have a more positive attitude toward ITV than students who do not interact.
2. Students who participate in verbal interactions with teachers and peers through the use of the desktop microphone will achieve higher scores in the ITV chemistry class than students who do not interact.
3. Students at remote sites will have less interaction than students on-site.
4. Students at remote sites will have a more positive attitude toward ITV than on-site students.

Methodology

Thirty students, eighteen females and twelve males, who were enrolled in an analytical chemistry ITV community college class in a metropolitan area of the Southwest were studied. The thirty students were each asked to complete the Revised Student Opinions Survey, which had previously been used in research done on distance education to determine attitude levels of high school students towards the medium of ITV, the instructor's use of the medium and the class content. This survey contained seven demographic questions requiring short answers followed by 17 Likert-like statements with response choices from "strongly agree" to "strongly disagree." The achievement levels of the thirty students were determined by scores from three, two-hour chemistry examinations.

Collection of data continued through interviews with both administrative personnel and students. The instructor, technicians, campus distance education coordinators, and district coordinator were queried not only to determine the background information on the ITV program but also to solicit information concerning the implementation and utilization of the medium. Finally, the researcher observed each class session, excluding labs, either in person or later by videotape to record the number of interactions and the student(s) involved. Each interaction was also coded as to its purpose, i.e., question, confirmation, media problem, or social. Each interaction was further coded according to the student's location.

Results of the data analysis indicated several interesting points. First, the main cause for the lack of interaction among students during the ITV class was student communication apprehensions. Using a microphone and not being able to see other students resulted in serious lack of interaction. Even the "wait-time" offered by the instructor did not seem to have a significant bearing on the amount of interaction that occurred during the class. Second, students who evidenced a higher rate of interaction had a slightly higher achievement level that those who never interacted. Interviews with students showed that students who used the microphone often, more than once per class, were more involved with the topic of chemistry and spent slightly more time preparing for the class. This reason alone may have accounted for the higher achievement of this group of subjects. More research is needed to determine if the medium of ITV can be improved in such a way as to increase the interactions among students and between students and instructor. Additionally, more research is needed to determine the effects of limited interaction and achievement.

Cluster Session (T37C)

Producing Graduate-Level Teacher Professional Development Courses via Interactive Compressed Video Systems

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Keywords: distance education, compressed video, teacher training, interactive video

Abstract

This project is the result of a research grant funded by The Texas Center for Educational Technology, and was conducted in the Spring, 1993. There were two aspects to the research. First, a summary and analysis of current research on distance education with an emphasis on compressed video systems was produced. Second, two graduate-level distance education classes taught at Texas Tech were employed as experimental groups. The impact of the individual learner's learning style and the achievement and attitude of both on-campus and distant learners were studied. Results showed distance education to be at least equal to face-to-face instruction if appropriate teaching strategies are followed and individual learning styles are considered.

Summary of Current Research on Distance Education via Compressed Video

Compressed video systems usually consist of two-way interactive video and audio between an originating site where the teacher is located and one or more remote sites where learners are located. Video and audio signals are "compressed" so that they can be carried by regular telephone lines.

Distance education delivery via compressed video technology is clearly an effective means of providing instruction to learners at a distance. Interaction among course participants can vary over a wide range because of the capabilities of this delivery system. As a result, it is important for educators who use this technology for delivering instruction to know how to use the system, understand its capabilities, and know how to apply those capabilities to enhance instructional delivery. This in turn will provide the best possible learning outcomes for participating learners.

Compressed video provides many advantages as an instructional delivery system. Advantages, such as the ability to provide immediate feedback to learners and to have interactive personal participation among all sites, enable this delivery format to be highly effective. Additionally, students benefit from this format by experiencing similar learning and achievement levels as students who receive instruction through the traditional classroom setting.

Other advantages of Interactive video that play an important role in providing effectiveness include the visual capabilities of the system, open-line audio transmission, and the sharing of many resources, including master teachers.

Research indicates that instruction delivered via compressed video requires structured planning and development. The use of instructional design principles to achieve effectiveness in course planning and instructional delivery is imperative. There are many instructional design models that can help the course designer accomplish the planning and development of distance education courses. Although no one specific model has been determined to be the most effective in aiding the course designer, the use of such models has proven to be effective in producing interactive television instructional delivery effectiveness.

Course planning for compressed video system delivery requires the designer to know the characteristics associated with distance education systems, the available resources, how course content is to be delivered, and learner characteristics and learning styles. Planning teams can be utilized, and the number of participants can vary from one to many.

Studies show that teachers are concerned with selecting course content and materials, covering the course content, class process, ongoing planning activities, student participation, teacher-student communication, and student characteristics.

McGreal's (1991) guidelines for teachers provide a model for producing instructional materials for distance education. Also, Parker and Monson (cited in Moore & Thompson et al., 1990) reveal techniques important to course development that include humanizing, participation, message style, and feedback.

Specifically targeting conditions that will help students learn in remote settings is important. Teaching methods and models will prove effective with the interactive video medium. Knowing the characteristics and learning styles of the learners will help increase the effectiveness of the instruction development and delivery processes. Including delivery strategies that accommodate for both field-independent and field-dependent learners will provide for a wider range of learners.

Existing research and literature provide these recommendations for training teachers for distance education via compressed video:

- Provide teachers with an overview of the technology and how it works.
- Provide hands-on guided practice on the use of interactive video technology.
- Incorporate the effective elements of instruction as major parts of the training session.
- Have periodic follow-up inservice and on-site coaching to ensure long-term training benefits.
- Use with teachers who volunteer for interactive video training (Thompson, Simonson, & Hargrave, 1992, p. 42).
- Establish the amount of time needed to prepare and teach distance-delivered courses.
- Develop methods to establish and maintain effective communication with distant students.
- Provide experiences with other faculty members.
- Incorporate strategies for adding visual components to audio courses.
- Plan and manage organizational details involved in distance delivery.
- Use strategies to encourage group cohesion and student motivation.

In delivering instruction through the compressed video medium, existing research and literature suggest the following guidelines for distance education courses:

- Adapt instruction to meet the varied needs of the students, the content, and the limitations of the delivery system.
- Hold a pre-course audio or video conference to increase student familiarity and comfort with the system.
- Familiarize students with each other and with the instructor: develop/distribute student and instructor biographical sketches, make on-air introductions, have students state their names and locations when they address the group.
- Maintain phone-in office hours so students can call collect.

- Develop skills to facilitate students' learning on their own and in concert with other students at a distance.
- Work with students to minimize and rectify technological problems (p. 3).
- Emphasize and encourage active student participation.
- Teach to the camera. This gives the remote student the impression of eye contact, which is critical to personalization.
- Travel to, and teach from, each remote site if possible.
- Devise formative evaluation techniques in order to assess the success of the class as it is being taught (Thompson, Simonson, & Hargrave, 1992, p. 42).

Distance education courses taught via compressed video systems can be effective and rewarding. Proper course design, development, implementation, and evaluation will ensure that remote learners receive the maximum benefits from the delivery medium. Learning opportunities for DE learners will continue to improve as new strategies and advancement in technology enhance the delivery of instruction via compressed video.

Summary of Experimental Research

Students enrolled for the Spring term 1993 in two graduate-level courses offered through a compressed video system located at Texas Tech University were used as the sample group for this study. Both courses met for one three-hour class session one evening per week for a 14-week semester. Students were located at four sites, one of which was the originating site where the instructor was present. The courses were EDIT 5301: Selection, Evaluation, and Acquisition of Instructional Materials, and EDIT 5325: Planning and Developing Instructional Materials. A total of 27 students were enrolled in EDIT 5301 and 35 were enrolled in EDIT 5325.

Instruments employed in the study were as follows: 1. Student Profile Survey, 2. Pre- and Post-Tests of Knowledge (of course material), 3. Student Attitude Survey, and 4. The Canfield Learning Styles Inventory. The Student Profile Survey, Pretest, and the Canfield were administered at the first class session. The Post-Test and Student Attitude Survey were administered at the last class session.

Major results of the study are as follows:

- There were no significant differences among student groups located at the four sites in terms of learning style.

- Significant differences were found in terms of attitude toward the course based on individual learning style. Generally, field-independent learners were more positive toward their experience than were field-dependent learners.

- Students who had prior experience with distance education were found to be more satisfied with the compressed video instruction.

- There were no significant differences in gains in knowledge of course material among the four groups.

- Self-reported gains in knowledge were high among all groups.

- The attitudes of all groups of students toward the courses and toward the distance education medium were consistently high.

Recommendations based on this study are as follows:

- Instruction should be adapted to meet the needs of learners with varying learning styles.

- Interaction including effective questioning techniques and group interactions should be included in distance education courses.

- Instructor lectures and presentations should include a variety of visuals to focus attention and clarify concepts.

- More research is needed in effective course delivery and particularly in specific methods of dealing with a variety of student learning styles.

Distance education delivery via compressed video technology is clearly an effective means of providing instruction to learners at a distance. It is important for educators who use this technology for delivering instruction to know how to use the system, understand its capabilities, and know how to apply those capabilities to enhance instructional delivery. This in turn will provide the best possible learning outcomes for participating learners.

Cluster Session (T38A)

Communication Networks for Case Studies in Business Education

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Keywords: case studies, group work, computer literacy, assessment, information as resource

Abstract

A series of case studies enabled by electronic mail has been included in the syllabus of business studies courses at City University Business School. While they use the established method of a case study to teach about business, they also encourage students' awareness of the importance of information and of group working skills. The case studies were initially introduced to assist with the assessment of students at MBA level and have evolved successfully in response to feedback from participants.

Background

Electronic case studies were introduced into the syllabus of a one-year full-time MBA course in response to two factors:

- Students had asked for more experiential learning in the computing module within the MBA course; in particular they felt that their assessment, in this module, using a series of essay questions, was too artificial. In any case this was weak as a *process* assessment (Rowntree, 1977) because it could be passed with no ability to use information technology.
- There was a need within the MBA to introduce more group work by students, and to introduce a structure within it was essential for groups of students to work together effectively. The tasks performed by managers in business include a strong emphasis on group work (Mintzberg, 1973).

A case study where information was distributed to the students, in stages, by electronic mail during a term offered an accurate simulation of the pace of work in real life. Encouraging groups to participate using electronic mail jointly, and with a moderator able to send messages to one member of a group only, created an environment where it was difficult for students to act as freeloaders.

Implementation

The case study was implemented using a (fictitious) engineering company based in the English Midlands. This company was faced with issues such as the purpose of its information technology department, so students were confronted with technology issues at the same time that they were studying them in the case. One of the aims of past management simulations has been to reduce prejudice between students (Jones, 1989), and the groups of MBA students were set up so that each had a spread of different abilities and backgrounds.

In the two years that the study has run it has been developed to take account of students' comments. In current thinking about management development there is a lot of emphasis on the use of simulations as tools for developing staff in business (Senge, 1990). The simulation used at City can be developed, especially with the inclusion of data from actual businesses, to be of value in management development.

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Cluster Session (T38C)

Student/Teacher Connections: A Mutually Rewarding Learning Environment

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Keywords: email, electronic mail, telecommunications

Abstract

Electronic mail is an excellent way to enrich almost any teaching environment. Both students and teacher save time, develop deeper relationships, and grow in their knowledge of the information age. This session will explore some guidelines for implementing an electronic mail component for nearly any course.

Project Summary

As a former public school teacher, I have found the number of contact hours with university students very limiting. In the limited number of class meeting hours, it is difficult to get to know my students well enough that I can support their learning in ways that I prefer. Electronic mail has provided a resource that fills that gap for me as an educator. At the same time, I have found the use of electronic mail to be an excellent vehicle for broadening the horizons of my students and for leading them toward a better understanding of the information age.

For the past couple of years, I have required that every student in my class have an electronic mail account and that each one use that account. This use of electronic mail is required no matter what other content is included in the course. Although I teach primarily technology-related courses, this use of electronic mail has been found to be useful in a variety of settings (Wang, 1993).

Implementing E-mail in a course that is not focused on telecommunications can be a challenge. For example, getting novice computer users to make use of electronic mail can be difficult. There are a number of strategies that help encourage students to make use of this communications medium.

Initially, an effort is made to sure each student has mail nearly every day during the first few weeks of the course. These initial messages are designed to be inviting and informational. They are often messages distributed to the entire group and include information about using the E-mail system effectively, reminders about class assignments and due dates, and invitations to communicate. Secondly, a concerted effort is made to reply to messages as quickly as possible. The third strategy is to put information on-line that is not easily available elsewhere. Thus, when a question arises in class that can't be answered "on the spot" those answers are sent as soon as possible via E-mail rather than passed out during the next class as a handout. Sending class-related material prompts questions about how to save or print E-mail and thus engages students in using electronic mail at a slightly deeper level.

For the first few weeks of a term, a few minutes of each class are devoted to E-mail demonstrations and questions. This helps students gain confidence and share problems with others so that they feel less isolated in their problems with the somewhat unfriendly E-mail system available at our site.

During the course of a term, some students become regular E-mail users. These students delight in the ready access to their teacher and their peers. A few students are very resistant and seldom reply to a message, although most students check their mail because of class-related information that they need. The majority of students use E-mail occasionally when they have questions, need help, or want to set up an appointment.

The gains for both teacher and student in this environment are significant. Stronger relationships are established that often last well beyond the end of a class. Students become aware of the value of instant access to personal assistance or knowledge. Further, both students and teacher save time because there is less need for setting up appointments to answer short questions or solve small problems. Everyone gains by easy access to on-line sources of information and E-mail access to outside experts.

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Theme Session (F1C)
Forward to the Future

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Keywords: multimedia telecommunications, curriculum, networking

Abstract

Brushy Creek Elementary School is rapidly becoming a "school of the future." A technology transformation is evolving throughout the school and taking us beyond the four walls of our building. As we restructure our learning environment and curriculum to integrate technology as a "tool" for learning, we are preparing our students for their future and not our past.

Technology Empowers Teachers and Students

Technology has empowered Brushy Creek teachers and students in innumerable ways, It has enabled them to utilize a variety of current resources through electronic mail and across the network within the school. Students' research skills have been sharpened as technology has enhanced the gathering, interpreting, evaluating, and applying of data. Students and teachers have also improved their abilities in working together cooperatively, communicating effectively, and using critical thinking skills. Technology has increased the active involvement of students in the learning process and has helped to create an environment that is interested and success-oriented.

Multimedia

Technology has provided teachers and students at Brushy Creek Elementary a wide range of audio visual equipment. VCRs, CD-ROMs, video disc players, Xap Shot cameras, video cameras, and hand-held scanners have allowed students and teachers an opportunity to combine different media into multimedia presentations that add a new dimension to curriculum and classroom learning. Student and teacher "teams" work together cooperatively for the development and implementation of interdisciplinary, computer-assisted, interactive courseware which complements and supplements existing curriculum. Multimedia encourage students to make decisions and to express themselves creatively as they become actively involved in the learning process.

Telecommunications

Telecommunications via a modem and computer is a tool that is broadening our students' knowledge about their world. It also serves as a tool to improve communication and accessing current information. Brushy Creek Elementary School is totally networked so that students are able to telecommunicate directly from their classrooms. Teachers and students have been carrying out research with others across the state of South Carolina and around the world. In May of 1993 students communicated with their 49th and 50th countries, Uganda and Kuwait.

Theme Session (F2A)

New York City Distance Learning Initiatives: NYCENET/NYClassNet/NY CLIN

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Keywords: CLIN, distance learning, interactive video

Abstract

This presentation highlights three initiatives of the New York City Public Schools (NYCPS). NYCENET is the nation's largest instructional bulletin board system. NYClassNet is a public/private sector partnership that created a 45-megabyte interactive video network between New York City High Schools and cultural and academic resources in New York City. NYCENET and NYClassNet culminate in the New York Community Learning and Information Network (NY CLIN). As part of a national initiative with 16 states and the District of Columbia, the NY CLIN will link community resource centers throughout New York State with interactive video and multimedia classrooms. The NY CLIN will energize K-12 education while it stimulates the economy.

NYCENET

The New York City Educational Network (NYCENET) logs over 25,000 calls monthly from over 15,000 regular users. NYCENET offers a message base (over 300,000 messages left yearly), databases that include a direct link to the United Nations, ERIC, and Grolier's Encyclopedia, and news wire services such as Associated Press and CNN. NYCENET is a Class "B" Internet domain.

NYClassNet

NYClassNet is a public/private partnership that created a 45-megabit digital interactive video network linking four NYC high schools, Lincoln Center, and the City University of New York. The philosophy of NYClassNet is that distance learning networks should bridge social and psychological distances as well as geographical ones. Partners in this project are the NYCPS, the City of New York Department of Telecommunications & Energy, The City University of New York, New York Telephone, Northern Telecom, Lincoln Center Institute, and the New York Times.

NY CLIN

The New York Community Learning and Information Network is linking otherwise disparate information networks statewide. As part of a national grant through the Advanced Research Projects Agency (ARPA), the NY CLIN will link 46 sites statewide to share resources in a shared-usage environment. City and state agencies, the National Guard, CUNY, SUNY, and NYSERNet, are linking together to create a series of community-based interactive video and multimedia classrooms. NY CLIN is a defense-conversion effort that will change the way we conduct business, government, and education in New York State.

Theme Session (F3A)
Building a Global Community Of Student Researchers

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Keywords: telecommunications, international, students, environmental, research, investigations

Abstract

Over the last three years, the Global Laboratory Project, implemented by TERC and the U.S. National Science Foundation, successfully involved 300 high schools in over 20 countries in student-based investigations around environmental issues. This paper will describe how the project accomplished this pedagogical feat through a strategy that included:

- *international computer-based telecommunications*
- *shared innovative curriculum*
- *high-tech, low-cost instrumentation*
- *on-line scientists.*

Introduction

This past spring, the following message was transmitted on an international telecommunications network.

> Hello,
>
> We're glad that we'll take part in Total Column Ozonometer testing. We've already got in touch with Belsk (Polish Academy of Science's research station) and on Tuesday (27 April) we will go there where we'll learn about stratospheric ozone measurements with the Dobson spectrophotometer.
>
> Best regards,
> Elzbieta

From the other side of the world, this inquiry soon appeared.

> Elzbieta-
>
> We in Pueblo, Colorado are interested in the measurements you took while at the Dobson instrument in Belsk. What measurements did you take? Did you get enough data to calibrate your instrument? Anything you can tell us will help as we will soon be visiting a Dobson in Boulder, Colorado.
>
> Thank you,
> John

Was this exchange between professional scientists who were collaborating from their respective research labs? Was it between academicians seeking to educate their graduate students to atmospheric studies? Or perhaps it involved the meteorological bureaus of two countries? In reality, these messages were exchanged via telecommunications between two high schools, one in Poland, the other in the United States, that were involved in the Global Lab Project. Worldwide, scientists are using only some 60-80 professional Dobson spectrometers to monitor the thinning stratospheric ozone layer. To these ranks, Global Lab already has added nine high schools from Poland, Mexico, and the United States, that are using specially designed, low-cost tools to measure stratospheric ozone, and will add another twenty by the end of this year. If anything, the above messages were routine within the project's telecommunications network.

Air Quality Studies

When asked their concerns, the students of the Global Lab class from an inner-city school in San Antonio, Texas, suspected their classroom's air was poor. To test their concern, they placed Petrie dishes with a growth medium by air ducts and soon found contaminants. Using instruments supplied by Global Lab, they measured CO_2 levels and found them to be unusually high. The class posted a request over the network for collaborative data.
What are some of the CO_2 levels that people are getting inside their various classrooms?

> Ours are just extremely high...

From their Global Lab colleagues in Aiken, South Carolina, they received the following message:

> Hello San Antonio:
>
> We read your report about carbon dioxide and have a similar case here in Aiken, SC...

With their concerns apparently justified, the class reported the findings to the local school board. Their teacher, Linda Maston, telecommunicated what ensued.

Four men from the environmental control section of the district showed up...They went to the counseling office where the counselors and teachers told them what was going on. They were not impressed, so they were brought to my classroom. As soon as we pulled out our data and graphs showing the (CO_2) patterns, they suddenly started to take notes...The moment of glory came when they showed up with the same kind of tubes we had, and their fancy pump got exactly the same readings as we had with our (Global Lab) syringe version! Way to go TERC! Needless to say, they were surprised, and I am sure it went a long way to validate (for students) the data we have been collecting.

Alkaline Snow

Russian scientist Alexander Gregoryev took Global Lab students from several Moscow schools on a field expedition to measure the pH of snow at environmentally hazardous locations. They were surprised to discover that the snow around a cement plant was highly alkaline. Gregoryev telecommunicated their findings to other Global Lab schools worldwide, which stimulated several from other countries to perform similar tests.

Nitrate Studies

Sharing a common concern that over-fertilization can result in dangerous levels of nitrates in food supplies, Global Lab classes in Wellesley, Massachusetts, Moscow, Buenos Aires, and Milan, Italy, collaborated over the project's network to study nitrate levels in different fruits and vegetables. In order to compare their data, the classes designed over the network a joint protocol. After monitoring these network communications, the Global Lab class in Aiken, South Carolina, proposed to their colleagues that they measure nitrates in water runoff from over-fertilized golf courses and determine the impact on nearby lakes and ponds.

Water Quality

Sixteen Global Lab schools in various countries pioneered the use of ion selective probes in their water quality studies. These inexpensive yet accurate devices measure lead and other heavy metals in water. The students at the junior high school in Quincy, Massachusetts, met after school to calibrate the probes for their worldwide colleagues. They included calibration curves when they shipped the devices to their "heavy metal" colleagues and tracked the performance of each probe.

Tracking Pesticides

Another fourteen Global Lab schools piloted immuno-assay test kits, the latest development in biotechnology, that enabled students to determine levels of PCBs and other pesticides in food and drinking water. Led by the Global Lab class at Bradford College near Boston, schools performed precise analyses and shared their findings over the project's network. One of their surprise findings was high levels of pesticides in coffee.

Other Global Lab schools investigated the perplexing migrations of Monarch butterflies, conducted weather and climate studies, and performed advanced research in aquatic, coastal, and terrestrial ecology. When later asked about the impact of this advanced research on students, one teacher responded,

> This is the first time the kids have ever had a real hands-on type of science course, where they're actually going out and measuring the things themselves and using some materials they've never used before, then making their own conclusions. Not doing pre-canned labs has got to be one of the most important things about the program. They're going out and not knowing what they're going to be measuring, and then having to look at the results and draw some conclusions. It's not something that's just coming out of a textbook.

Over the course of the school year, Global Lab's one hundred schools scattered throughout eighteen countries performed advanced research, collected data of scientific quality, and made a real impact on their communities. Global Lab classes telecommunicated over 2,500 messages in the process of conducting collaborative, student-based research and submitted their findings in eighty-five research reports.

Barriers to Student-Based Research

Historically, the barriers to student-based research have been formidable. Students lack the motivation to perform original science research. Indeed, many study science only because it is required of them. Compounding this problem, many students lack the background knowledge, collaborative skills, and an understanding of scientific methodologies.

In addition, teachers often are isolated from each other, removed from the scientific community and its resources, and out of touch with current developments in science. Even skilled teachers lack the resources to develop innovative curriculum. They are hard-pressed to organize groups of schools for collaborative work and establish the standardized procedures that are essential to sound research. Schools also lacked the funds to acquire the sophisticated tools required for true investigative science.

Global Lab successfully overcame these barriers by implementing an innovative strategy that integrated key components into one cohesive and accessible package. The project offered schools an international community of like-minded teachers and students, telecommunications among all participants, curriculum that provided relevancy and shared goals, and the technologies needed to perform real science. No one component will provide student-based research; all are necessary.

Creating an International Community of Student Researchers

First, the project created a community by recruiting schools around the world and linking them via telecommunications. The challenge was to develop a sense of togetherness among students who were separated by oceans, mountains, cultures, and languages.

Computer-based telecommunications enables educators to create an international infrastructure in which hands-on, real-world science pedagogy can flourish. It allows the shared distribution of educational resources and encourages collaborations among schools. It stimulates the community-wide establishment of standardized techniques and methodologies, which are essential to collaborative science.

This electronic community enabled a key step of the scientific process – peer review in which participants ensure common goals and standards of quality. For example, Moscow students posted a message expressing concern about the accuracy of measurements of the angle of the sun. The school urged all Global Lab participants to eliminate anomalous results by collecting data more carefully.

Structure of Global Lab Telecommunications

Structurally and metaphorically, Global Lab is designed as a real-world networked science laboratory. In schools from New York to Moscow, from the deserts of Qatar to the

Arctic Circle, our students know that they belong to an interactive global village populated by teenagers such as themselves. Over dedicated teleconferences, students can converse with their colleagues from around the world and post messages on the project's bulletin boards.

To facilitate Global Lab participants, the project operated and maintained a set of project-wide teleconferences within EcoNet. As if in a science institute, students had access to an electronic bulletin board, an electronic library, a teleconference for project-wide discussions and another that served as a marketplace for research ideas and collaborators. In addition, each research group had its own teleconference. Telecommunications served as an important motivational tool that allowed students to share their results and established true scientific collaborations among participating schools, scientists, and TERC.

Project-Wide Teleconferences

The project used a series of conferences for general project-wide communications. These included: a "Start" conference, in which Global Lab schools posted their first messages and introduced themselves and their selected study sites; a "Library" of Global Lab related reference material; a bulletin board for general announcements to and from participants; a "Forum" conference for conversations on topics of general concern and interest; the "Ideabank" teleconference, where classes posted their research agendas and recruited collaborators; a "Teachers" conference specifically for teachers to exchange views; and "Reflection," where teachers evaluated their work and developed new ideas.

Telecommunication Clusters

In order to unite schools and foster communications and collaborations, we organized our schools into eight clusters. The clusters provided a sense of neighborhood and softened the threatening appearance of a worldwide network. Opening screens and banners were purposely informal and inviting to participants. In this year's project, we have further encouraged intimacy among schools by subdividing each cluster into groups of four schools called quads.

Moderators

To support participants in their telecommunications, the Global Lab created a committee of network "moderators," one for each cluster. Moderators were teachers oriented in the project's use of computer networks who assisted schools within their clusters with telecomputing. Moderators met with the Global Lab staff once a month in workshops to address telecommunications, curriculum, and technology issues.

International Communications

The international sites, which made up some 30 percent of the project's schools, were among the most enthusiastic members, communicating frequently not only on the conferences and E-mail, but also sending messages addressing the toughest scientific issues.

For international telecommunications, the Global Lab used EcoNet, a computer conferencing network maintained by the Institute for Global Communications (IGC). In many locations, SprintNet dial-in access provides reliable connections to the computer network through local telephone numbers. EcoNet also provides "gateways" through other computer networks such as Internet and Bitnet to further extend the communications potential. Many international sites had access to one of the member networks of the Association for Progressive Communications (APC). These are similar to EcoNet with the capability of low- or no-cost mail forwarding and conference shadowing among members of the group of networks, such as GlasNet in Russia, Web in Canada, and Pegasus in Australia.

Though it provides the foundation, telecommunications itself does not assure a dynamic student-learning environment. When asked to improvise on the network, most students will opt for a penpal relationship with a distant peer, and this is not sufficient to motivate either teachers or students to tap into the pedagogical possibilities of telecommunications.

Student Relevance

For the educational process to be most effective, students must want to learn, and students are motivated when they appreciate the relevance of the curriculum. What is relevant to students' daily experiences that, when scholastically examined, can also reveal good science? One field that is both scientifically fecund and interesting to high school students is environmental studies. Arguably, students are more concerned with the well-being of the environment than are adults. Whether teenagers' concerns stem from a fear for the planet they will inherit or plain horse sense, environmental studies can draw upon this relevance and root science education in a real-world setting with real-world concerns.

Real-World Studies

The project stimulates relevance by taking students out of the tedium of textbook studies and lab exercises into the reality of their own worlds. Real-world environmental studies allow students to study what is immediate to them– their homes, their neighborhoods, and their communities. These studies range from measuring the thickness of the ozone layer to testing food and soil for pesticide residues to investigating the quality of the indoor air that students breathe.

In another departure from conventional classroom curricula, students selected what *they* wanted to study. They chose their study sites, a locality accessible to the school that they would environmentally investigate. We found that empowering students to choose what to study increased both their motivation and their curiosity. A number of classrooms chose environments important to their communities.

> [their study site] was the dump for the hamlet, and most of the wildlife is dormant during the winter season, and this site provided an area where there was a definite impact by man on the environment." Bishop of Attagutaluk, Alaska

> ...the problems we've been having in the community ...the area is really polluted, and they've been fishing in the same area." Janet Watson, Iona, Jamaica

> Probably [we would choose our study site again], because we are about the most polluted site in town..." Mary Albrechtson, Mexico City

Global Lab teachers noticed an increased student awareness of community concerns.

> ...We would like to expand it to include a little more in the local community to see the effects that pollution has on it." Carl Jagdeo of Jakarta, Indonesia

> ... Our school is located on the American consulate grounds, so there is a lot of foreign vegetation. The site the students came up with is further out, with a lot more native vegetation and soil." Cindy Tollefson, Saudi Arabia

Real Research

We took pains to communicate to our students that they would conduct real scientific research. Upon completion of the Global Lab year, the students would know the key parameters of their study sites better than anyone else, including scientists. For the duration of the project, they would be true pioneers and even their teachers and textbooks would not know the answers to the questions we posed. They could take justifiable pride in knowing that one column of data in the Global Lab database was their very own. It was a tangible and useful result of their hard work.

Project-Based Learning

Conventional high school science studies are often compartmentalized. Students tackle one task one week and another on the following week, and quite often these tasks have only tenuous connections to each other. The project-based design of Global Lab, on the other hand, enables students to build toward identifiable goals over the school year. Its structure unifies for students the project's many tasks into a common purpose. Their education becomes a succession of interrelated exercises that build upon each other. Students know and understand what they are working toward, and can enjoy a well-deserved sense of accomplishment upon completing their enterprise.

By capitalizing on students' interests, the project provided students with relevancy and the desire and need to share data. The project's network and curriculum were, in effect, a virtual laboratory and science forum. Indeed, the network even assumed the role traditionally held by scientific journals, in that it served as a medium for the propagation and analysis of the community's research.

Structure of the Global Lab Year

The core philosophy of Global Lab is to teach basic investigative skills, methodologies, and scientific ethics to students before they undertake advanced research projects. The project introduces students to the discipline of science while encouraging the intellectual freedoms that students need to direct their own research. These disparate goals were achieved by closely directing student research at the beginning of the year and offering open-ended research opportunities at the end.

Consequently, the Global Lab year was divided into two main stages. The first, *Building Investigative Skills,* was designed to teach students the procedures and techniques needed for collaborative student investigations. Once they had completed this stage, students were ready to conduct their research in the project's second stage, *Advanced Research.*

In the first semester, the curriculum guided students through a series of skill-building procedures called Environmental Snapshots. At the same hour on prearranged days, Global Lab schools, using low-cost, high-tech tools, made synchronized environmental measurements of their study sites. They collated their data into standardized templates and these data formed a project-wide database. These directed research procedures prepared students with invaluable skills such as data-collecting and collaborative techniques.

Global Lab then engaged students in open-ended research by asking them to choose a field for additional investigation from a list of nine. The project supported this research with tools, scientists, and protocols, but the students themselves developed and implemented their research strategies. After the Environmental Snapshots taught Maston's class the fundamental skills of research, her students were empowered to investigate scientifically the indoor air quality of their school.

Affordable Technology

A primary barrier to student-driven investigations has been the high costs of research. Scientific investigations require highly accurate measurements, which in turn necessitate expensive instrumentation. Yet for several reasons, the Global Lab Project offers scientific tools that are state-of-the-art yet affordable by schools.

First, TERC has developed the means to adapt sophisticated instruments for high school education. Billions of dollars are spent annually to develop technologies, but middle and high schools traditionally had to wait decades before advances trickled down to them. With the exception of computers, the teaching tools of many high school labs are still ninteenth century technologies. With its technical expertise and understanding of pedagogical needs, TERC uniquely bridges industry and education and transfers technologies to science classrooms. From electronics, biotechnology, space, and other industries, TERC identifies advanced technologies with potential educational applications, adapts them for low cost and ease of use, and makes them available to schools.

For example, the inexpensive but effective air test tubes that made such a difference in Linda Maston's class were state-of-the-art instruments based on the latest advances in physical chemistry and gas chromatography. However, these tubes require costly, high-tech pumps to draw precise amounts of sampled air. Global Lab's engineering team designed a hand-drawn syringe pump that despite its simplicity is accurate. Whereas professional air pumps range from $300 to $1,200, the TERC Air Pump used so effectively in San Antonio costs $10.

In an example that would have been science fiction a few years ago, Global Lab schools in Kansas piloted a genetically engineered strain of yeast that is an excellent bioindicator because of its sensitivity to UV. Behind this innocuous-appearing yeast are millions of dollars invested in researching the molecular mechanics of UV sensitivity, DNA reparation processes, and advancing genetic engineering. Global Lab will offer this product to schools at nearly no cost. Such transfers to the education market may be the best, most cost-effective way to produce generations of technologically literate students.

Although the principal research has been completed when a technology is transferred, development costs are needed to adapt technologies for specific classroom use. Herein is a key but often overlooked reason for the affordability of Global Lab tools. Their adaptation cost was subsidized by the National Science Foundation, and the savings are passed directly to the schools. Global Lab schools pay only for parts and construction labor.

The Global Lab Starter Tool Kit may be the low end of available tools, yet it empowers students to make all the basic measurements called for in the Global Lab year. In order to meet the needs of schools with advanced pedagogical objectives, Global Lab offers sophisticated instruments, like the ion-selective probes and the TERC Datalogger, which forms the heart of the Remote Environmental Monitoring Station. Though high-end compared to the project's basic tools, these instruments are accurate, yet much less expensive than their professional equivalents. An excellent example already in use by Global Lab schools is TERC's Total Column Ozonometer, a $300 tool that was adapted from professional UV photometers. Though millions of dollars were invested in these exotic technologies for professional use, TERC now makes them available for high school science classes.

Student Access to On-Line Scientists

On-line scientists are a powerful means of support for student investigations. Their involvement helps verify for students the scientific authenticity of their work. Scientists also provide invaluable assistance to teachers, particularly when an investigation is outside a teacher's expertise. Last year, Global Lab successfully recruited professional scientists in fields such as biochemistry, biophysics, chemistry, and ecology.

These scientists demonstrated that collaborations between scientists and students are productive. When Global Lab recently posted on a variety of telecommunications networks a call for on-line scientists to support schools' air quality research, the following message arrived:

From: Ken Muzal
Specialty: Air Quality Measurements, Industrial Hygiene Chemistry, Analytical Chemistry.
I would like to join the corps of Global Lab Scientists.....

His contribution was appreciated immediately. From their experiments, Linda Maston's students had concluded that high CO_2 levels were the cause of their poor air. But when the students established contact with Ken Muzal, they learned that "given the nature of our school, how it was built, and the pattern of CO_2 levels that we had observed, ...it was very obvious that we had a problem with inadequate ventilation." From this contact, students deepened their understanding of cause-and-effect relationships and realized that the level of CO_2 was a measure of the effectiveness of their ventilation system.

Summary

Global Lab has demonstrated over three years that students are indeed capable and willing to engage in hands-on, real-world, collaborative science curriculum. We can easily envision a day when 1,000 or 10,000 schools are networked together to conduct environmental experiments so accurate that the scientific community would rely on their data. From such synergies, the planet's scientists of tomorrow will emerge.

Theme Session (F3C)
ICS: Large-Scale Projects for Middle and High Schools

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Keywords: K-12, curriculum, simulation, Internet, wide area network, social science, environmental science

Abstract

Over the course of a decade, the Interactive Communications & Simulations program has become a firmly established undertaking offering a set of computer-mediated exercises for secondary and middle school students. Many thousands of students in over 400 schools (urban, suburban, small-town and rural; public and private) in 34 states, 4 Canadian provinces, and 22 countries overseas have been involved in many dozens of separate exercises.

ICS - Interactive Communications & Simulations

The Interactive Communications & Simulations (ICS) program of the University of Michigan School of Education is a collaborative undertaking between university faculty and students, on the one hand, and faculty and students in schools throughout the United States and around the world, on the other. As a computer-mediated undertaking, it is over a decade old and has evolved from a single role-playing simulation into a broad-based and expanding set of educational programs. ICS exercises are large-scale and demanding ones. Each of them engages many hundreds of students in dozens of schools for extended, typically term-long, periods of time. Furthermore, they call for a considerable commitment on the part of both students and teachers. However, they also tend to motivate participants to a great degree so that the demands become rewards. For each exercise ICS provides very extensive resource materials of both a substantive and a technical nature. These are distributed in the form of ICS Notebooks. ICS also provides equally extensive and varied human assistance in an effort to guarantee that both students and teachers achieve full success in their participation.

Global Classrooms

ICS exercises link participants in different schools via the medium of computer technology. Confer II, the University of Michigan-based computer conferencing system, provides the linkages and enables groups of students throughout the United States and the world to be in ongoing communication with one another. Schools need only have microcomputers, a modem, and communications software. When participants in an exercise connect by telephone to the Confer system, they enter an ICS global classroom. Participating students and their teachers thereby spend part of each school day with a highly diverse and widely dispersed group of peers far removed from their school neighborhoods.

Communications Exercises

ICS, as its name indicates, offers both a number of communications exercises and a number of simulation exercises. In each the Confer computer conferencing system is the medium of interaction among students and teachers located in widely dispersed schools. The following are the ICS communications exercises:

International Poetry Guild

Language can be both powerful and beautiful, and this combination of power and beauty often results in art. The International Poetry Guild, a dramatically new departure of the ICS program, has been created to help young people develop a sense of the power and beauty of language by writing and publishing poetry. Therefore, it fits directly into the secondary school language arts curriculum. The International Poetry Guild is the first ICS exercise to emerge directly from an ICS participating school rather than from the ICS staff at the University of Michigan

The idea for the Guild was that of Ray Wilcox, of Avondale Middle School in Rochester Hills, Michigan. He did the bulk of the development work related to the exercise and served as the Guild Director for the inaugural run of the exercise. The International Poetry Guild calls on each participating school to establish, edit, and publish its own poetry journal. These journals will be edited by the students in the class or extracurricular activity who are directly enrolled as participants in the Guild.

In addition, any member of the student body of any participating school is encouraged to write poems and submit them for publication in any of the Guild's several journals. Each school's journal will be edited by its own editorial staff. These staffs will at the outset of the exercise establish their journals' particular editorial policies — what the directions and focuses might be, what poetic styles they might give preference to, as well as what their titles are to be, and so forth.

Throughout the course of the exercise each editorial staff will be in charge of reviewing the poetry that has been posted on the "IPG Bulletin Board" and selecting poems that meet both its editorial policy and its standards. In this fashion, all of the editorial staffs will be doing their utmost to encourage students in all schools to write the very "best" poetry that they can. The goal of each editorial staff is to produce and publish a journal of excellence. At the end of the exercise a panel will review the published journals and present the International Poetry Guild Journal Awards to the schools that have published the finest journals. In addition, individual students will receive awards as outstanding poets for works that they have presented throughout the exercise.

At their discretion, Guild Mentors may elect to bestow additional awards on the various journals and/or poets. It is the combination of the editing that each of the editorial staffs does, and the writing of poetry that all students in all participating schools are encouraged to undertake, that makes up the International Poetry Guild. During the exercise students will have the opportunity both to work with colleagues as editors and to engage in intensely personal activity as writers of poetry. In addition, participants will be engaged with others around the world in an endeavor of considerable excitement.

"I have never witnessed such a metamorphosis in my students. Their writing (of poetry) improved tremendously."
Janet Stone, George Dewey HS, Subic Bay, Philippines

"Our students are already asking if they'll have an opportunity to participate next year! Never did I anticipate the overwhelming response to express(ing) their thoughts and opinions via poetry."
Pat Dawsoyar, The Valleys Senior School, Mississuaga, Ontario, Canada

1990's Earth Odysseys

The 1990's Earth Odysseys is an interdisciplinary program that has two principal intents: to provide participating students with an engaging form of vicarious travel and to use that travel to create an environment in which participants can examine the world in which they live. To accomplish these purposes each individual Odysseys exercise takes participants on a dramatic voyage of discovery while at the same time providing them with a set of engaging curricular activities in the areas of the environmental sciences and social studies. The end result of participation in an Odyssey is that students become more knowledgeable about the world, about its geographical and ecological diversity, and the rich and varied cultural expressions of its people.

During the 1993–94 school year two Odysseys will be offered. The Odysseys program grew out of a dream of crossing the Sahara desert, and the first Odyssey was designed and organized with that in mind. In late January 1991, when the first group of Odyssey travelers was on the point of departure, the outbreak of war in the Persian Gulf created conditions in Northwest Africa that forced a rerouting of the voyage to Eastern Europe.

Thus emerged the first Odysseys exercise: Eastern Europe in Flux. In the spring term of 1994 the Eastern Europe in Flux Odyssey will be re-run yet again. This exercise centers on a varied group of people from the United States, Canada, and Germany who undertook a three-month trip through a dozen countries of Central, Southern, and Eastern Europe during the late winter and early spring of 1991.

From the outset it was the intention of ICS to mount a new Odysseys expedition every year or two. In the fall of 1992, Columbus in Perspective was launched. At the center of this undertaking is a group of people who retraced the route of the initial Columbus voyage of 1492. They send in the "logs" of their trip as they proceed. A recent translation and modernization of the actual log of Columbus will also be posted for participants on a daily basis. During the course of an Odyssey, each traveler, or "correspondent," files on a regular basis reports of what s/he has been experiencing. These reports may deal with anything that the travelers want to report on, but the intention is for participants to be exposed to as broad an array as possible of the phenomena that one can encounter when traveling. The reports are made available to student participants on a daily basis during the course of the exercise. A variety of curricular activities in the social studies and environmental sciences are provided for each Odyssey — activities that have been designed with upper elementary, middle dchool, and high school students in mind.

The following are examples of topics addressed: societal diversity, political boundaries, clothing and mores, European expansion, material culture, transportation, plant and animal migration, water, scientific discovery and technology, and recycling.

Participating students and their teachers may select from among the curricular units offered, and from the several activities that may be undertaken under each unit. The Odysseys exercise has been designed to provide flexibility to allow each school to tailor its participation to its own particular needs.

"This [offers] an excellent opportunity to stave off provincialism in students by opening a window on the world electronically. Comparing the time allotment and access to a professional educational staff to other programs offered by large communications programs, this is wonderful." –Bill Hurst, Hull HS, Hull, Massachusetts

"I learned more about the countries around the world in 95 days [than] I have ever learned in the whole time I've been living."
–Navneet D., a student at Darcel Avenue Public School, Mississauga, Ontario, Canada

Simulation Exercises

At its inception ICS had only a single offering, a role-playing simulation on the Arab-Israeli conflict. Over the years a diverse group of other simulations have been developed, and additional ones are in the planning stage. These simulations all have certain defining characteristics, but the principal one is that all of the roles that participants play are specific real-world characters. Currently, only the Arab-Israeli Conflict Simulation is offered to schools.

Arab-Israeli Conflict Simulation

The Arab-Israeli Conflict Simulation has been the mainstay of ICS for the decade and a half of its existence, at both the secondary school and the university levels. Beginning at the University of Michigan during the 1973-74 academic year, the Arab-Israeli simulation has been mounted many dozens of times, as both face-to-face and computer-mediated exercises. At the university level, the Arab-Israeli simulation has been one among a number of subjects that have been addressed by means of the ICS format. Nevertheless, it has represented the great majority of such exercises. Most have been of a face-to-face nature, but five during the late 1970's were computer-mediated and served as the arena in which the synthesis between the ICS-type simulation and CONFER was tested.

At the secondary school level, the Arab-Israeli simulation was the only ICS exercise offered from 1984 through the fall term of 1986. All Arab-Israeli exercises have been computer-mediated, as now are all ICS endeavors mounted from the University of Michigan. The Arab-Israeli simulation has been the model on which most of the evolutionary development of ICS has taken place. Indeed, the Arab-Israeli exercise is in essence the basic format of ICS. The sixty roles represented in the current simulation are organized into twelve country teams. Seven of these represent states directly or indirectly involved in the conflict. Four represent parts of political entities that are also involved, but that are better organized as more than one team because of the nature of the political reality they represent. Generally each team is located in a different school so that all diplomatic communications are mediated via computer. All of the roles represented in the simulation are very high-level governmental or political figures. With but a very few exceptions — a few "Private Envoys" — all are also the actual individuals currently holding the offices represented. Therefore, the simulation is based on the highly dynamic, and dramatic, context of the current reality. Abstraction and generalization are thus far removed.

The participants in the simulation are involved in three basic forms of activity, in addition to being participants in the domestic political and governmental affairs of the country teams within their own schools. First and foremost among these computer-mediated activities are the sending and receiving of private diplomatic "Messages." Each participant has a subset of a half dozen or so foreign figures with whom such messages may be exchanged. The "Communications Matrix" that this represents has three purposes: to help participants more closely simulate the real world, to help them focus their attention and activity, and to help distribute the diplomatic work load among all the participants on a team. The second activity that participants are involved in is the sending and receiving of "Press Releases," the medium through which they make public pronouncements. Finally, the participants, being high-level political figures, can take political, economic, or military actions by means of "Action Forms." All of this activity is mediated in a variety of ways by a "Mentor" group located at the University of Michigan.

The purpose of the ICS Arab-Israeli simulation is to immerse participants in the complex dynamics of a highly salient, dramatic, and multifaceted international political reality. This experience is intended to help students become more sophisticated citizens with a greater appreciation of the complexity of domestic and international politics.

"[My students] are in the library, arguing about foreign policy all the time. They tell me it's the best class they've ever had."

–Roberta Magid, Kimball HS, Royal Oak, Michigan

"The thing I like most about it is that it promotes research; so much of the learning is self-actuated...the best kind! [My students'] growth in understanding of the Middle East crisis was incredible in such a short period of time!"

–William Thibodeau, Center for the Arts and Sciences, Saginaw, Michigan

Mentor Group and Team Facilitators

ICS exercises are supported by the mentor group based at the University of Michigan and by individual team facilitators located in each participating school. The mentor group is composed of university faculty and both graduate and undergraduate students. Its functions are several and vary considerably with the individual exercises. In a general sense, however, it organizes, administers, and trouble-shoots the exercises, facilitates and stimulates the broadest possible levels of participation, and controls appropriate degrees of reality and accuracy where this is appropriate. In the case of some exercises, control of this sort is based in part on sophisticated computer software. The team facilitators in each school have an equally critical role to play. They determine the focus of ICS within the school: a class devoted to the exercise, an option within a class, or an extracurricular activity. They arrange access to microcomputers, a modem, and a telephone line. They help participants organize their team(s) and pace student activities in terms of daily team activities and periodic deadlines. Finally, they provide a form of "Socratic questioning" to stimulate more reflective participation on the part of the students. Facilitators are not expected to be either computer experts or highly trained specialists in the subject matter in question. Rather, they are to concentrate on stimulating careful, creative thinking.

Theme Session (F4A)
Improving Academic Instruction through Comprehensive Collaboration

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This presentation is a summary of first-year activities and results related to Florida Institute of Technology's four-year funded project from the U.S. Department of Education's Educational Partnership program. The purpose of this project is to effect fundamental educational improvement through the application of telecommunications to teacher training, instruction, and the involvement of parents and businesses with education. Central to the project is the global computer network called Internet.

The project consists of the following three major components: to investigate ways in which the delivery of teacher resources and inservice teacher training and enhancement activities offered through the Space Coast Center for Excellence can be restructured using telecommunications; to develop new lines of communication to empower parents with both the capability and the opportunity to have a more active role in education; and to develop a high school telecommunications course to make students aware of the field of telecommunications as a possible vocation. First-year activities concentrated on the first two components and involved two high schools from the Brevard County (FL) School District and one high school from the School District of Indian River County (FL).

The activities associated with these two components included delivering an Internet connection to the Center for Excellence and the three target schools, establishing connectivity directly to the teachers' desktop Macintoshes, establishing SLIP/PPP links to the homes of participating teachers and parents, training teacher and parent participants, and formally evaluating the educational impact of the data communications infrastructure that was established. At present a total of fifty teachers from the three schools are participating in the project. A summary of our experiences will be reported during this presentation and includes the following: the development and contributions of our business partnership, problems we encountered in establishing connectivity to the target sites, problems teachers encountered using their new connections, the manner in which teachers implemented Internet resources into their classes, and teachers' perceived reactions to having direct and unrestricted access to global resources from their desktop Macintoshes.

Support for many of the activities associated with this project was provided by the Florida Tech Educational Partnership, which consisted of members from both educational and business communities. Educational community members included Florida Tech, the Space Coast Center for Excellence, and the Brevard and Indian River County school districts. Members from the business community included Digital Equipment Corporation, Tampa, FL; Commercial Communications Systems, Inc., Orlando, FL; Network-1, Long Island City, NY; Cabletron Systems, Inc., Rochester, NH; and Sumitomo Electric Fiber Optics Corporation, Research Triangle Park, NC. Contributions pledged by partnership members included equipment donations, consulting services, and reduced costs on hardware and software products. The total cost of first-year project activities was $453,874. Of this amount, the U.S. Department of Education contributed $300,000, and the non-federal share, which was being provided by the Florida Tech Educational Partnership, was $153,874.

Theme Session (F4C)

CIAO! – Highway to the Future

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Keywords: telecommunications, Free-Net, infrastructure, community

Abstract

This paper documents the experience of the community of Trail in iys effort to develop, organize, and implement a Free-Net telecommunications infostructure in a small community in the interior of BC. The objective is to give the students, community services, business and industry access to information on the same scale as it is obtainable in larger metropolitan areas.

Trail Community Infostructure

Trail is now in the process of developing an economic strategy that will help guide the community into the next century. A key part of the emerging strategy is the development of a new communications and information infrastructure (an "infostructure") that is now necessary for communities to compete in the global economy. The Community Information Access Organisation (CIAO!) represents all of the stakeholders in Trail and the neighboring communities of Rossland, Montrose, Fruitvale, and Genelle that are involved in developing this community infostructure. The present document is being presented to CIAO! in order to obtain input before the implementation of the proposed infostructure.

Background

The Trail School District (SD #11) has obtained approval for a capital budget from the Ministry of Education, which will be used to establish the foundations of such an infostructure. In particular, it is envisioned that this money will be used to acquire a central electronic mail server, to establish a wide area network which will link all of the fourteen schools into the board office or some other central location, and to provide a link to the nearest point-of-access to Internet.

In July 1992, the school district issued a "request for information" (RFI) and received written responses from a number of vendors. Three of the responses (B.C. Systems Corporation, B.C. Tel, and Digital Equipment of Canada) proposed approaches in which their organization would provide comprehensive solutions.

Although innovative and attractive from a technical point of view, these solutions have a number of disadvantages:

1. They require a relatively high operating budget. One recommended solution would require an annual operating budget of $123,000 for telecommunication costs alone. Although this would serve the fourteen schools in the district, it would increase by $7,000 per annum for each site (public library, small business, etc.) added to the network.

2. Such solutions would have minimal impact on the Trail economy in that outside experts would install, manage, and maintain the infostructure, and most of the infostructure operating costs would flow outside the community.

3. There would be minimal sustainable spin-off from the outside expertise to the local community. Local knowledge and expertise would be neither utilized nor strengthened and there would be little, if any, transference of the external skills into the community.

The solution that is explored in this document is, therefore, of a community-developed and -managed infostructure, which minimizes operating costs to a point where they will be attractive to a wide number of users, maximizes the economic benefits to the local communities, and draws on and strengthens local expertise.

Challenges

A community-developed and -managed infostructure presents a number of challenges that must be addressed if the project, as a whole, is to be successful.

1. Technical Challenges

Although the community wide area network described in the RFI issued by the school district in July 1992 is based on proven, widely used technology known as the Internet family of protocols, there has been little experience in installing systems based on these protocols in the school district. There will inevitably be new demands on technical staff, they will experience a significant learning curve while they become familiar with the relevant products and services, and the installation is unlikely to be as quick and painless as if it were totally handed over to outside experts.

2. Enabling Challenges

Unlike highways and other familiar infrastructures, the new infostructures are largely invisible and poorly understood by their potential users. However, experience in places such as France and Singapore clearly indicates that once the new infostructures are in place, they rapidly become an indispensable part of every aspect of modern life. The challenge facing Trail and the surrounding communities is not just to establish a state-of-the-art infostructure but to encourage its use for a wide variety of applications, particularly ones with an economic development potential.

3. Organizational Challenges

Although the Community Information Access Organisation (CIAO!) represents all of the stakeholders, it is the school district that has received the initial funding. If this project is to proceed on a fairly broad basis, then other sources of funding, particularly operating funding, must be obtained and an appropriately staffed organization should be established.

Technical Decisions

The responses to the RFI and recent events, such as the introduction of the $1.15 billion Information Infrastructure and Technology Act in the U.S. Senate, confirm that the architecture proposed for the community wide area network is still the preferred way of proceeding. However, the responses also put into sharp focus the need for a number of early technical decisions. Should Trail take control in establishing the initial infostructure or should it select a vendor to handle this task on its behalf?

As already noted, there are three main advantages to a locally controlled installation: cost, economic impact, and local sustainability. The cost considerations are most readily quantifiable, and operational savings of an order of magnitude are possible without any significant decrease in performance. However, if it is to be successful, a locally controlled installation needs to be carefully planned and adequate resources must be made available. In the same way that planning a new building usually benefits from having an architect and any number of specialists on call, planning for the new infostructures needs to include external advice at both a high and a detailed technical level.

Which vendor should be selected for providing the central mail server?

Although some vendors included providing a central mail server as part of a broader response, since the key software will be based on widely adopted international standards and is being piloted in school districts such as Armstrong and Shuswap, it is relatively straightforward to isolate the vendor of the central mail server from the other parts of the infostructure. Unfortunately, the vendors who proposed mail servers in response to the RFI made a wide variety of assumptions about what type of machine would be required, and so it is difficult to compare them on an equitable basis. The most appropriate solution may be for the Trail School District to issue a separate RFP (request for proposal) which clearly defines the options required for a mail server to a number of vendors as soon as possible. What steps can be taken to begin implementation as soon as possible, while allowing a high degree of flexibility in selecting different options as the installation proceeds?

Despite the fact that the community wide area network will be based on proven and widely used international standards and regardless of whether a locally controlled or vendor-supplied infostructure is established, it is important that Trail and the surrounding communities are able to take advantage of the cost savings and performance improvements that are ongoing in this rapidly changing area.

A "router" is an essential piece of telecommunications hardware that is necessary to link the community wide area network to Internet. It is also recommended by a number of responses to the RFI as "requiring the least amount of maintenance and support and has the capability to grow in capacity without any significant equipment changes" for linking the schools to the wide area network. An early acquisition of a router by the Trail School District and the establishment of a link to Internet would, therefore, begin the implementation of an infostructure in earnest, while still leaving open the option of implementing many of the innovative suggestions obtained from the RFI responses.

Organizational Decisions

The projected benefits for Trail and the surrounding communities accrue primarily from the use of the proposed infostructure. It is essential, therefore, that parallel to the implementation of the (telecommunications) infostructure an enabling (human) infrastructure also be established that will:

- provide vision and leadership to establish clear goals
- aggressively champion network based services
- reduce costs and improve access to the infostructure, particularly for users outside the fourteen schools.

The Community Information Access Organization (CIAO!) is ideally placed to meet these challenges, but it must be provided with the means of accomplishing them. In terms of human resources, this will require planning, project direction and community organization, and technical support.

Furthermore, while the technical issues are crucial, particularly in the early stages of implementation, if the initiative is to be successful the technology should become largely invisible to the users and the focus should be on a wide range of applications.

The staffing model recommended by the National Public Telecomputing Network in the U.S. (the umbrella body that has been responsible for promoting the development of Free-Net Community Computer Systems) is probably a good starting point for discussion, even though Trail's plans are more ambitious than any existing Free-Net. NPTN recommends the following staffing:

- project director
- system administrator
- clerk (1/2 time)
- system manager (1/4 time)

In the NPTN model the project director is first and foremost a community organizer, able to locate individuals and organizations in the community and get them to participate in the system. The project director is also responsible for fundraising; introducing ways in which the system (as a whole) can be improved; and directing, developing, and promoting the project on an ongoing basis. The system administrator is responsible for day-to-day operation of the system. This includes everything from answering questions and complaints from users and information providers, to making sure that routine clerical and system maintenance activities run smoothly. The position of system administrator will, therefore, require more technical knowledge than that of project director. The system manager provides the technical expertise to keep the computer system running smoothly.

In the case of Trail, the initial technical requirements are a great deal more complex than the typical NPTN scenario, since a community wide-area network is planned. It is probably prudent, therefore, to ensure that resources are such to provide a separate project director and system administrator, with the latter having considerably more technical expertise than in the NPTN model. On the other hand, since the initial demands on the central mail server are likely to be more straightforward than for the typical NPTN community, it may be that the role of system manager can be handled by the system administrator with the assistance of someone who is on call, say, from Cominco. Last, but by no means least, it is essential that Trail be able to call on outside expertise to assist with planning, project direction, and technical advice. Ideally, this advice will deal with the organizational and human development issues as well as the technical ones and will result in an infusion of skills and knowledge into the community in a sustainable way. At least 10 percent of the budget should be allocated for this purpose.

Next Steps

If this initiative is to be successful, the telecommunications infostructure and the enabling human infrastructure must have a broad enough mandate and sufficient resources to achieve its goals.

The Community Information Access Organisation currently represents all of the stakeholders, but it has neither the project staff nor the funds necessary to proceed with the initiative. The school district has been given approval for a capital budget and has some staff resources that could be assigned to the project. Similarly, a wide range of resources are available in cash or in kind from a variety of sources that could be made available as soon as the project is under way.

The most desirable course of action appears to be to proceed with the implementation as quickly as possible. This suggests that a number of steps need to be taken almost immediately:

1. A project director should be appointed. Since there is no operational funding yet in place, this will require that someone from one of the participating organizations be assigned to play this role. This could initially be less than a full-time assignment if professional assistance can be obtained for planning, project direction, and technical advice, but even with this assistance it is desirable that the project director becomes a full-time commitment as soon as possible.

2. A reporting relationship between the project director and CIAO! needs to be formalized. This could range from CIAO! acting as a steering committee creating a separate corporate entity (e.g. a society). At this point the form is perhaps not as important as a clear understanding of the various roles and responsibilities.

3. An implementation plan for establishing the infostructure needs to be approved. A draft implementation plan is appended for discussion purposes.

4. A global budget for the infostructure needs to be approved and the project director given authority to issue requests for proposals (RFPs) and purchase orders (POs) within this budget. A draft global budget is appended for discussion purposes.

5. Resources for implementing the telecommunications infostructure need to be made available to the project director, so that the implementation can begin as quickly as possible, while allowing the project director to focus on activities such as developing a business plan and getting individuals and organizations to plan to use the infostructure for a variety of activities.

6. A business plan, strategic priorities, and a set of critical success factors for the initiative as a whole need to be developed, so that it has adequate ongoing resources to succeed and its success can be clearly demonstrated.

Theme Session (F5B)

Inquiry into Science Teaching by a Network-Mediated Science Teachers Community

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Abstract

The use of telecommunications for teacher professional development is explored here, in the specific context of introducing a shift in science teaching approach and using telecommunications for reflective discourse about the process. Based on a case study of one such group, the paper highlights the complex and challenging nature of the contribution that networks could make to such a setting. One of the most difficult aspects noted in this paper is the design of the network-mediated reflective practice learning environment to do exactly that — to provide teachers with a forum to reflect on their teaching practices. The design of such a forum requires much attention to social and technological factors, some of which are noted in this paper.

Network-Mediated Teacher Professional Development

How to teach science in an effective and informative way and how to intrigue students of science are two questions that science educators face regularly. A large part of this dilemma involves the question of how to support teachers in a way that fosters collaborative work. Teachers need to be informed about science teaching and activities in order to enhance their teaching practice.

Using an educational network is one method of linking science teachers so that they can compare science teaching methods and communicate about their practice. So far, research on network-mediated teacher-teacher collaboration for professional growth has been limited (Gal, 1993; DiMauro & Gal, 1993). A relevant question to the educational-technological community is

Could a network be used to support teachers' learning of new teaching practice? If so, what conditions are needed to foster such use?

In this work in progress, we examine this question using data from LabNetwork, a telecommunication network of the LabNet project. LabNet which began as a three-year, $2.6 million effort funded by the National Science Foundation (NSF), is now in its second phase of three years (1992-95), funded by NSF. Aimed primarily at high school science teachers, LabNet has three interrelated goals:

- encouraging the use of student projects to enhance science learning;
- building a professional community of practice among high school science teachers
- using appropriate educational technology and telecommunications when possible

Reflective practice as a criterion for effective network use

LabNet's challenge was to create an interactive space to enhance reflective discourse over the network. We view teachers as professionals — expert educators — who are part of a community of practice with common expertise and ways of working (Ruopp, Gal, Drayton, & Pfister, 1993). At the same time, we recognize that teachers lack the time and opportunity to reflect on their work experiences, and often, like many other professionals, they lack the skills to do so as well (Argyris & Schon, 1974; Schon, 1983).

Reflection is not a standard component of teacher practice, and teachers are not offered many opportunities to learn in such a way (Bamberger, Duckworth, Gray, & Lampert, 1982; Apelman, 1985). Effective professional development, we assert, must provide teachers with opportunities to reflect on their teaching practice with other teachers and educators in an ongoing way (Grimmett & Erickson, 1988; Clift, Houston, & Pugach, 1990).

The use of telecommunications networks so far has either avoided or yielded limited success in promoting reflective discourse about teaching and learning (DiMauro & Gal, 1993a; 1993b). This also appears to be the case in the scientific community (e.g., Carley and Wendt, 1991). In a scan of network literature we differentiated five practices of network use, listed from most to least available: to link teachers with colleagues and professionals, to offer teachers access to information, to carry out joint teaching activities, to develop skills of reflective practice, and learn new teaching approaches. The list also represents a spectrum from utilitarian to pedagogical approaches to network use.

The two most common and widely accepted purposes of the use of telecommunications for professional development are to link teachers with colleagues and professionals; and to offer teachers access to information databases or teaching materials (Ruopp et al., 1993; Honey & Henriquez, 1993; Katz, McSwiney, & Stroud, 1987). Another common approach is to consider joint teaching activities as adding to teachers' professional growth. One example of teaching collaborations is Learning Links, a network where teachers work together to develop common curriculum (Riel, 1992). Yet another, but much less frequently used, purpose of telecommunications is to develop skills of reflective practice and to share professional teaching dilemmas (DiMauro & Gal, 1993a; 1993b; 1993c). A fifth approach, least common but perhaps most intriguing, is the use of telecommunications to mediate teachers' learning of new teaching approaches like the transition from traditional science teaching to project-enhanced science learning (Gal, Lockett, & Parrott, 1991; DiMauro & Gal, 1993a).

We targeted to create an opportunity for teachers to collectively examine their experiences, review their work, and consult with one another about means of improvement. Telecommunications should be a medium that fosters such discourse. Below, we share a case study of an attempt to create a project-enhanced science learning (PESL) focus group, designed and moderated by teachers for teachers.

Case Study: PESL-Focus Group

A PESL focus group was implemented on the LabNetwork in order to explore the possibilities of network-mediated science teaching. The initial idea for the PESL focus group was generated in a LabNet teacher moderators (TM) workshop in October 1992, where concerns over the lack of network use for teacher change were expressed by many of the teachers and project staff. The TMs designed an experimental focus group as a model for future focus groups to be conducted over the LabNetwork.

The focus group consisted of seven teacher participants and two teacher moderators. It took place over the course of six weeks, and the participants used *America Online*® for telecommunications. This group worked with an electrostatics project curriculum. Each teacher introduced the curriculum into the classroom and then responded to specific questions about the process. The focus group used the network to discuss teaching practice.

The group leaders, with an agreement of all the participants, decided to use the electrostatics activities curriculum *Teaching about Electrostatics A PTRA-PLUS Workshop Manual* (Morse, 1991), developed as part of the PTRA program of the AAPT, to experiment and reflect on the use of the PESL approach for science teaching.

The PESL group had a four-part structure: In the first week, participants are expected to enroll in the focus group by sending an e-mail message to the moderators. By doing so, they committed themselves to participate in the workshop according to its framework. In the second week, participants received the training materials, explored them, reflected on and communicated with the group about their experiences. In the following three weeks, participants explored the materials with their students in the classroom, and communicated and interacted about their experiences with the group. And, in the sixth and final week, participants participated in a summation, evaluation, and consideration of how these materials may be fashioned to encourage PESL philosophy and the suitability of this process as a model for electronic focal groups. In addition, they were expected to maintain personal journals about the time spent on the above, as well as to communicate their feelings and observations about the process of the group.

Methodology — The Study of the Purposeful Use of Networks

Our analysis of the network-mediated PESL focus group relies on two sources of data: the network messages and semi-structured post telephone interviews. We have analyzed the data in order to investigate how a network could be used to link teachers for a professional development activity. We also look at the strengths and weaknesses of network-mediated discussion for PESL and reflective practice.

Network messages

All the network messages (n=41) of the focus group were downloaded and saved. We also downloaded all the messages (n=25) sent between the workshop leaders and between them and TERC staff members. We analyzed the network messages looking primarily for three elements:

1. Patterns of network communications. In our past work we identified three modes of network communication — informative, responsive, and reflective — which tend to differ on a number of parameters, including content, intent, and length of message (DiMauro & Gal, 1993a; 1993b).
2. Individual contributions to the network discourse. We investigated which messages had most impact on the discourse and what data from the messages was used (or referred to) in the network dialogue.
3. Group interactions and learning from the network discourse. We examined the messages significant group interactions that demonstrate transitions in the network dialogue and in the participants' learning.

Telephone interviews

Following the network dialogue we conducted semi-structured interviews with all the participants. We also held a one-hour semi-structured conference call with the two workshop leaders. The telephone interviews lasted from thirty minutes to two hours. One participant was interviewed face-to-face at her classroom, during the workshop, in addition to the telephone interview. All the interviews were audiotaped and fully transcribed.

The interviews covered four areas: participant's expectations from the workshop; experience with application of the teaching materials in class and perceived students' experience and learning; involvement in the network dialogue; reflections about the group, the teaching materials, and telecommunications as a forum for teacher development.

Method of data analysis

We approach this study from the users' viewpoint but with the pedagogical perspective of reflective practice. Very few studies have addressed the question of the purposeful use that teachers make of telecommunications from the teachers' viewpoint and actual experience (Bruce & Rubin, 1993; Gal, 1993b; teacher essays in Ruopp et al., 1993, and in JRRE, 1993; Newman & Torz, 1990). We are interested in finding out the purposeful use that teachers made, as a result of the focus group, to improve their practice toward the PESL approach. We assume that a "shift" in practice requires a reflective stance by a teacher about his/her own teaching, which a group could help to mirror and explore (Gal, Lockett, & Parrott, 1993). We sought signs for such directions in the data.

To explore teachers' shifting and reflective stance, we developed the following procedure. We first read all the network messages: then we read the telephone interviews and selected all events mentioned in regard to the four major categories of the interview. Next, we matched the findings from the telephone interviews with the participants' messages in the network dialogue. Through this process we arrived at a wide range of expectations, classroom experiences, and teachers' perceptions of students' experiences, network dialogue experiences, and reflections on the participation in the network-mediated focus group.

Our next step was to match the network dialogue with the excerpts of the participant's interview. We looked for variations, modes of expressions of the issues mentioned in the interviews, and topics and situations that were not expressed on the network. Based on our learning from this analysis, we have begun to sketch a composite of the group experience and to map important factors that influenced the group's work.

Since this is a work in progress, in this paper we now share only the first stage of the data analysis, of participants' perceptions of their experiences based mostly on the telephone interviews.

Initial Findings

We grouped teachers' responses into three domains: teachers' use of the materials in their classroom, teachers' participation in the network dialogue, and teachers' suggestions for future network-mediated teacher workshops. In this brief paper we focus on the first two issues, as we would like to use as much space as possible to engage the readers in considering the challenges and the potential that network-mediated teacher development faces, rather than seek solutions.

Teachers' use of the materials in their classroom

The purpose of the teaching materials was to introduce and to enhance teachers' use of PESL in their science teaching. The teachers found multiple uses for the materials in their classrooms. The most common response was that teachers found the teaching materials useful in thinking of new ways to introduce electrostatics. A typical response was

> I would say that, for some reason, I never gave much attention to the use of neon bulbs in studying electrostatics. And I found that to be just super. It was a neat, neat way of talking about the transfer of charge from place to place. And I thought that the kids learned a great deal from that.

Some teachers were intrigued by the materials to reflect on their knowledge of electrostatics. For example,

> I learned a lot about the electrostatics materials. How to set up a good explorative environment. The materials were excellent for that. I saw a lot stuff [that] was brand new for me.

The use of specific materials also served the teachers as a springboard for experimenting with new teaching modes in the context of the PESL focus group. Mostly, these were small experimentations that were built on the current knowledge of the user and the existing teaching framework and curriculum. Still, they enabled some of the teachers to examine their teaching and to think about alternative projects. For example, one teacher remarked that he engaged students in longer and more open-ended projects when using the electrostatics materials:

> I think that for a long time I have done a lot of, I've structured my class in ways that the kids do things, loosely hands-on, whatever that means. Now this [the electrostatics] was a bit different in that it was a bigger project set up so that the kids' understanding the thrust of the thing, would go ahead and do it over a period of a whole lot of days. That was different for me. And that was good. I liked that, and it opened up other possibilities for me. And I've done other things since that time with different classes. Sort of setting up something as a long-range thing. The kids kind of understand the task. I give them materials. I suggest some questions and then have them do that. So I think this has pushed me more in that direction. I like that. So that's a learning for me. That's some kind of an improvement in the way I'm doing things, I think. More than I think, I'm pretty sure.

For another teacher, the workshop was an opportunity to step back and look at the students at work with less involvement, which led him to consider a different role he could play in the classroom:

> Well, one thing, I found that in terms of teaching I didn't have to do a lot of teaching. I mean I just kind of roamed from group to group and observed and...and asked questions and helped them focus. Which was...it really is an extremely different way from the way I usually teach. Our classes for several reasons are more lecture-oriented, although I'm trying to move away from that. But they're...we have some external testing pressures and things that don't let us be quite as freewheeling as I would like it to be.

Another teacher noticed that his best students performed the least well in the hands-on open-ended projects and found himself changing his perspective on them from looking only at their grades to considering whether they could *do* science:

> It was nice to have some experiments that could be plugged in, rather than requiring a lot of fancy equipment and field plotters and everything like that. This was really a tremendous boost to the electrostatics. Because that's one area that I've had a lot of frustration with trying to get labs that would actually work. This was a gold mine for me. And the teaching aspects of it, it led to...it fell in very nicely with what I had been doing, which was a lot of hands-on work. I would probably modify it in the future to make some of the questions a bit more open ended, rather than a cut-and-dried four-or-five word answer type of a question.
>
> ...And the other thing that struck me was the way that I sort of looked at students during this time. I tend to look at them in terms of test grades and whether or not they're doing homework problems and what kind of lab write-ups they turn in. So you kind of look at them as sort of A, B, and C students sort of thing. But during this particular phase I really

> looked at them not in those terms but as doers of science, and how...I was looking at them, and noticing and thinking about, you know, how good were the questions that they were asking, how good was the follow-up, how good was the investigation that they were doing. So I was really looking at them more in terms of the process, rather than just some sort of numerical grade or something.

We see the latter examples as most important transitions, they could be the start of a process of reexamining one's teaching and thinking about alternative ways to improve it. In another work, we (Gal, Lockett, & Parrott, 1993) note that shifting is most often probably how teaching changes. "Shifting," we wrote, "implies a series of small, sustainable steps rather than a rapid conversion to a new order. Each shift acknowledges the local context and sets the foundation for the next shift. Each shift interacts with and modifies the prevailing web of forces in a way that permits the next shift to occur. Over an extended period of time, this accumulation of shifts translates into profound educational change" (p. 63).

It is beyond the scope of this paper, but important to mention, that the process of shifting does not have a clear, well-articulated vision of classroom teaching. Rather, the adaptation of such materials, as was also noted by other researchers, is shaped by the local and personalized nature of school systems (Berman, Greenwood, McLaughlin, & Pincus, 1975) and the specific teaching modes of teachers (Gal, 1993a; Hall, & Hord, 1987; Hord, 1987). The PESL focus group appears to have served some of the teachers as an opportunity to take small steps that might lead to additional future steps in the direction of shifting their teaching approach.

Teachers' participation in the network dialogue

We now look at the role that telecommunications played for the teachers. We sought to look at the unique difference the network made for the teachers — change as it occurred above does not require telecommunications.

Both the structure and the paced discourse by teacher moderators seem to have helped some of the teachers to feel part of a group and to know where to direct their attention in the process, as one teacher noted:

> There were maybe, I don't know, four or five sets of these questions through the several weeks that the project went on. That was a very useful thing, it seems to me. Because it lends some structure to what it is that you can send out. It kind of focuses your attention on the particular issue, whatever it was. Did you find it easy to assemble the materials? Did you find that they worked the way that we said that they would work? And that sort of thing. So I thought it was helpful.

The questions and examples of teaching provided by other participants appeared to have helped some teachers consider issues that they face:

> [W]hen someone asked a question it made me think about, well, how would I answer that differently? How would I do that? And yeah, I found it informative. I looked at their

> questions and their answers, and sort of measured myself against it, what I would do differently or the same.
>
> The stuff that I think was most informative was the [teaching] stories. I really liked that, [it] was informative for me in the sense that that was the style of communication, it was really contributive, I liked that.

Many issues were raised regarding the modality of network discourse in this particular context and how it often blocked the teachers from actively telecommunicating with their peers. The common issues mentioned had to do with concerns about exposing and sharing with each other their teaching practices and dilemmas and the feeling of being over directed by the teacher moderators and not having enough room to raise their own questions and seek answers to them. For example

> [I] had expected more person-to-person dialogue, rather than having Moderator set up questions and then have us answer the questions...I was almost expecting a running summary from the participants. Well, today we did this and this happened, that sort of a thing.

To some the feeling that other participants were more skilled created a barrier to active participation:

> I say, as committed at least as I think I am to this [PESL], I probably am the least project-oriented teacher in the group. And so I may have felt intimidated by everybody...I mean everybody else seemed to be going great guns and this seemed to be just very natural for them to do. And I was really having to work to implement this, you know, to do this.

Reflection and active participation in the design of the workshop did not take place. For example, the pace of the workshop was sometimes felt to be too quick for participants to read attentively and respond to messages in order to develop an engaging network dialogue. None of the participants raised any of these issues with the teacher-moderators during the network dialogue. For the teacher-moderators, the low response to their questions was a concern, but they too did not share with the participants.

The issues raised by the participants in the telephone interviews suggest that the use of telecommunications for dissemination is acceptable, but its use for teacher-teacher support has to be more encouraged and actively facilitated.

Discussion

Telecommunications offers new opportunities to engage teachers in classroom examinations enhanced by a dialogue with peer practitioners. A major advantage that telecommunications has to offer teacher development is that the experimentation is here and now, it takes place in the teacher's own teaching environment, it can be quickly applied, and a peer group can respond and reflect on their experiences (DiMauro & Gal, 1993b). The approach transcends some of the traditional dichotomies, such as teaching and training, learning and experimenting, and teacher as trainer. Telecommunications can also offer long-term participation in a process of learning that is much more realistic and adaptive to the actual pace of shifting in teaching practice.

The actual design of such new learning environments for reflective practice of teaching is complex and requires much attention to social and technological factors. As we explore this domain, careful research that is informed by a sound pedagogical educational approach could help illuminate the task ahead.

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Theme Session (F5C)

From Gutenberg to Groupware: Building an Online Community of Rural Writing Teachers

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Abstract

There is much talk these days about an information superhighway. More attention should be given to the applications that make telecomputing useful for teachers — the on-ramps to the information superhighway. Tools that make access easier and less costly are essential if rural teachers are to take part in projects on the network. BreadNet, the K-12 network that I direct, is looking at the latest in graphical user interfaces and client/server software so that rural teachers — who often have to make toll calls to get to networks — will not be left out of the emerging information infrastructure. With a grant from the DeWitt-Wallace Reader's Digest Fund, from 1993 through 1996 we will be able to bring high school English teachers from six states (Mississippi, South Carolina, Vermont, Alaska, New Mexico, and Arizona) to a six-week summer graduate program at the Middlebury College

(Vermont) mountain campus. These teachers take two graduate classes at the Bread Loaf School of English — then work with each other on the network during the school year. We are providing full-tuition grants and grants for working on the network during the school year.

BreadNet was created in 1983 as a way for teachers, who work together at the summer programs, to continue to work with each other on-line during the school year. We have moved from E-mail and distribution lists (1984) to computer conferencing (1986) to client/server software and a host connected to Internet (1993). The client/server software we moved to this summer does not seem to be the best solution for rural teachers (we will change if better off-line readers are not developed). However, over the last ten years, we have learned much about shaping an on-line community of rural teachers.

What We Have Learned

When we set up a rural network in 1984, many said that electronic networks were simply too expensive and too hard to use. We overcame this problem by training teachers to upload and download effectively. We worked with more-evolved conferencing software, which let teachers and students work in small on-line groups (asynchronous work). We showed them how to "batch-read" notes from certain topics so that they spent very little time on-line. The conferencing software we used, while not allowing complicated threads, was actually the best way for rural teachers to work. If a teacher wanted to add a note to a topic (or conference) called "assessment," it was simple to do that. (Other number-based, more-threaded systems required a teacher to know to — for example — upload a response to note 5 in one conference and to note 36 in a second conference and note 17 in a third. Teachers in places like Alaska and South Dakota reported to us that uploading more threaded conferences was very difficult and that their connect time was being wasted. Yet they liked the conferencing software that allowed for some threading and work in small groups. One feature that it had was an institutional memory. If a rural teacher came into an online discussion late in the year, he/she could catch up. Batch-reading techniques made this affordable.

We learned that we need moderators to move discussions forward and that teachers prefer short (four-to-six-week) projects for their students — projects that are planned well in advance by on-line teams of teachers. This works best when three or four classroom are part of an on-line cluster. We learned that teachers want flexibility in what they discuss. Someone may start a topic and lead that discussion for several weeks. We learned that teachers want to create and announce projects, not have "canned" projects handed to them — but they also like projects with structure. They want affinity groups, such as "ideas that work for eighth-grade English teachers." A benefit that our network has over others is that most people meet face to face in the summer. The network is a continuation of a learning community on a mountain campus in Vermont. (Bread Loaf now has programs at Lincoln College, Oxford, and in Santa Fe, New Mexico.) However, we do include people who do not meet face to face.

Equity, Access, and Information Overload

We know that there are problems of equity and access for rural teachers who want to use networks. There is also the problem of information overload — and how information is presented. We have guidelines suggesting that people add notes no more than sixty lines to a topic. Most rural teachers would soon lose patience with listservs that have many postings a day, some very long. (I am thinking of one in particular where users don't hesitate to post testimony from a hearing in Congress or the transcript of a State of the Union address.) A bigger problem is separating messages in an E-mail box. If a teacher discussion about "assessment" is mixed with student writing from Alaska, it becomes frustrating for the teacher.

Problems with Our First Move to Client/Server Software

While many good client/server software packages are emerging, we have started trying one called FirstClass (by SoftArc from Canada). It allows teachers to have point-and-click access and to work in private conferences or on listservs or newsgroups on Internet. FirstClass is very easy for teachers to use and is a splendid tool for showing teachers how to use networks. However, it seems to be better suited for local area networks than for wide area networks. Rural teachers are reporting that it forces them to use too much time on-line. Even when they copy and paste in documents written earlier, it forces them to spend more time on-line than other client/server packages do. We are experimenting with an off-line reader for FirstClass, and it looks promising. However, at this point there are not off-line readers for MS-DOS and Windows users. If off-line readers for FirstClass do not emerge we will move to better tools for rural teachers. Some of our teachers will begin to experiment with Eudora by Qualcomm (for Mac and Windows users) and Nupop (for MS-DOS users). These client packages let the user compose messages off-line and upload/download quickly. For rural teachers who have to make toll calls to networks, these client/server software packages are a good solution. You lose some of the advantages of conferencing. For example, conferencing software lets you have topics separated from each other and from private E-mail — and lets you have an easy-to-use institutional memory for those who want to come in late and catch up on a discussion. Conferencing is a better environment for developing an on-line community such as ours. We hope that tools will emerge which make listservs and newsgroups more like the conferencing environment you get with software like Participate and Caucus.

Rural teachers, because of their isolation, find networks to be especially valuable — yet access is often too expensive. The drop in price of high-speed modems and emerging client/server software are making on-line access more affordable and easier to use for teachers who may have to make toll calls to get to networks. With the right training, tools, and structure, you can form an on-line community of rural teachers. Yet there is a need for better groupware for rural teachers — who tend to be the "have nots" of the information age.

Theme Session (F6A)
Network Learning Environments and Hypertext: Constructing Personal and Shared Knowledge Spaces

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Abstract

Educational uses of networks are rapidly expanding as the problems of ease of use and access are gradually being solved. However, the solutions may create second-order problems, such as students' and teachers' becoming overwhelmed with too much network generated information. In this paper, we present conceptual frameworks that capture some of the unique properties of network learning environments and that can be used to provide systematic guidance to the design of network learning activities and software tools to enable these activities. We illustrate these frameworks by showing how they have helped us design two different tools for educational uses of networks, a Message Assistant and a Project-Based Learning Server.

Considerable progress is being made in the development of a computer network infrastructure that can serve education. There is also research that suggests instructionally beneficial ways that distributed electronic networks may be employed (Bruce & Peyton, 1992; Hunter, 1992; Levin, Riel, Miyake, & Cohen, 1987; Newman, Goldman, Brienne, Jackson, & Magzamen, 1989; Riel, 1990). However, as researchers and educators begin to consider the more widespread utilization of network-mediated resources, the very richness of these resources imposes special logistical and cognitive demands on the user that may unfortunately mitigate the learning promise of educational network use (Riel & Levin, 1990; Ruopp, Gal, Drayton, & Pfister, 1993). A critical area for research involving network learning environments (NLEs) is this interface between the educational user and the network learning environment. Of course, software tools must be easy and relatively transparent for use by a wide range of students and teachers, and great strides have been made in software that is available to use and access network-mediated resources such as electronic mail, electronic bulletin board systems, and information servers. But the increasing power and ease of use of these network software programs is a two-edged sword. On one hand, students and teachers can now easily communicate electronically and access a wide range of information resources. On the other hand, with a huge mega-network like Internet (10 to 20 million users and over a million servers), a teacher may receive hundreds of messages in a day or have trouble deciding on which of the million Internet servers to look for a particular piece of information.

A new class of NLE tools is needed which preserves easy utilization of network resources, yet helps manage and filter unnecessary complexity that interferes with network-based learning activities. These tools need to be designed based on an understanding of the special characteristics of electronic networks to help support the attainment of substantive learning goals such as problem solving and independent thinking. We have proposed a distributed network learning framework that can describe characteristics of information flow on small and large networks. These characteristics, in combination with the speed and size of the network infrastructure being developed, constitute special conditions for a learning environment that are quite different from the traditional classroom and home learning environments. A systematic conceptual framework is needed that can guide the design of educational network tools.

In this paper we first review our earlier work on a perspective for understanding the distinctive characteristics of electronic networks that we call the *Distributed Network Learning Framework* (Levin & Jacobson, 1992). Next, we discuss a hypertextual "knowledge spaces" conceptual model which we feel has applicability for the design and use of NLE software tools (Jacobson & Levin, in press; Levin & Jacobson, 1993). This paper concludes with a discussion of research we are conducting that involves developing and studying the use of software tools based on the Distributed Network Learning Framework and the Knowledge Spaces conceptual model.

The Distributed Network Learning Framework

In our research on educational uses of networks, we have observed the flow of knowledge across the network, assisted by the active involvement of network mediators (Levin et al., 1987). We have begun to characterize these observations as a Distributed Network Learning Framework (Levin & Jacobson, 1992). In this framework, information and knowledge flow from where they currently are to where they are needed. The focus of our work with this framework has been to look at ways to structure networks, especially the mediators, so that learning can take place most effectively.

Why would anyone learn something? From the perspective of this framework, one reason people learn something is because it is easier than regenerating the information the next time they need it. As an example, people do not memorize every telephone number they call. If they are calling Joe's Pizza, they look it up in the phone book. The next time they call for a pizza, they might also look it up. If they get pizza a lot, they may write the number on a piece of paper and stick it next to the telephone. After a while, if they are real pizza fans, they will know the number to Joe's Pizza by heart. The phone number information thus moves from the phone book, to the piece of paper by the phone, and finally to the person's memory.

This phenomenon is even clearer with networks. The need to memorize (i.e., locally store) information is reduced if the ability to access it becomes easier. As networks and information technologies become more widespread and integrated into the world of work, the goals of education are shifting from knowing a fixed body of knowledge to knowing how to think independently and how to find information when needed. Furthermore, we live in a period of rapid change, in which knowledge that was true yesterday may not be true today (e.g., Joe's Pizza may move and get a new telephone number). Thus, "facts" are becoming increasingly fluid and changing. This simple example illustrates the distinctive elements of educational networks related to the flow of information that are described by the Distributed Network Learning Framework.[1] These features are shown in Table 1.

Table 1. *Features of the Distributed Network Learning Framework*

Distributed Network Learning Framework Feature	**Example Comments**
• Information flows through networks based on decisions made by mediators (students/teachers or a computer agent) at each node.	Pizza lover (i.e., the mediator) decides initially to look up the number, then to write it down on a note, then to remember it.
• Information and knowledge flow toward the location where the learners need it.	The phone number moves from the phone book, to the note, to the pizza lover's memory.
• Information appearing at a network node is stored locally if the mediators expect the information to be of value.	Pizza lover makes different decisions about locally storing information, first looking it up, then writing it down, and finally learning it. The phone number would not have been stored if the pizza had turned out to be bad for that piece of information would then have been judged to be of little value.
• Over time, mediators at nodes optimize the organization of locally stored information.	The pizza lover gradually optimizes her ability to access the pizza phone number, as it was initially slow access in the phone book, then faster access with the written note, and fastest when committed to memory.
• Network-based information is not a static, fixed "thing" but rather is dynamic, fluid, and changing.	Joe's Pizza may get a new phone number.

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[1] See Levin and Jacobson (1992) for a more complete discussion and rationale for various components of the framework. There are actually three main components of the framework: (a) network mediators and the flow of information and knowledge, (b) networks and cognitive theories of learning, and (c) the human-network interface. Given the space limitation here, we discuss only the first component.

Knowledge Spaces, Hypertext, and Network Learning Environments

How are we to convey these distinctive – but unfortunately somewhat complex and abstract – features of network learning environments to students and teachers? Given research on the value of an appropriate conceptual model to assist users in operating a complex device or computer program (Norman, 1988; Norman & Draper, 1986), we have been developing software tools for NLEs that employ a *knowledge spaces conceptual model*. The knowledge spaces conceptual model possesses a number of analogical components that can function at several levels relevant to NLEs. At the core of this conceptual model is a spatial analogy that has useful target aspects for describing important characteristics of electronic networks (e.g., "objects can be physically located in different places separated by space" maps to NLEs where "computers and people are physically located in different places and separated by space"). The knowledge spaces conceptual model also suggests other familiar systems that can serve as a coordinated set of analogies for describing NLEs. For example, "highway networks that connect physically separated places and people for transportation purposes" are analogous to "electronic networks that connect distributed computers for information transmission purposes."[2]

The knowledge spaces conceptual model can also be used to articulate abstract epistemic notions about "knowledge structure" and constructivist approaches to learning that are relevant to instructional uses of NLEs. For example, Wittgenstein (1953) employed the analogy of *knowledge-as-a-landscape* in the preface to his *Philosophical Investigations*, while *criss-crossing-a-knowledge-landscape* (inspired by Wittgenstein) has been used as an analogy for research into a constructivist conception of the nature of learning (Jacobson & Spiro, 1993; Spiro, Vispoel, Schmitz, Samarapungavan, & Boerger, 1987). An NLE may thus be "viewed" as a knowledge space that can be explored and criss-crossed for different purposes and from different conceptual perspectives, with different learning possibilities afforded by each traversal.

Another aspect of "knowledge spaces" is that they exist along a continuum from personal to shared (Jacobson & Levin, in press; Levin & Jacobson, 1993). *Personal knowledge spaces* are constructed for one's individual learning and knowledge-utilization purposes (e.g., personal electronic mail messages or a personal "knowledge base" intended only for a single person's reference or future use). In contrast, *shared knowledge spaces* are created for information and knowledge dissemination involving larger audiences (e.g., electronic mailing lists, bulletin board news groups, distributed information servers).

Hypertextual tools are ideally suited for constructing the conceptual interconnectedness that is central to our notion of personal and shared knowledge spaces (Jacobson & Levin, in press; Levin & Jacobson, 1993).[3] The core notions of hypertext — flexible nonlinear and random access linkages between nodes of information — are at once simple yet very generalizable to issues that are relevant to NLEs, such as flexible, nonlinear storage and access to information (Conklin, 1987). Also, research is beginning to emerge that suggests ways that personal hypertext and hypermedia learning environments can help students see important conceptual interrelationships and to learn complex knowledge better (Beeman, Anderson, Bader, Larkin, McClard, McQuillan, & Shields, 1988; Jacobson & Spiro, 1993; Jonassen & Wang, 1993; Lehrer, 1991). Research into the characteristics of hypertextual learning should inform our understanding of how to better design and use NLEs to enhance student learning. As we describe below, an area of research interest we are pursuing relates to applying design parameters for personal hypertext learning environments to distributed and shared network learning environments.

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[2] The use of multiple, coordinated analogies for network learning environments is important for it has been found that a single analogy can misrepresent important facets of a complex topic (Feltovich, Spiro, & Coulson, 1989; Spiro, Feltovich, Coulson, & Anderson, 1989).

Theoretical Frameworks and Research Projects

The Message Assistant. Some of the implications of the Distributed Network Learning Framework and the knowledge space conceptual model will now be illustrated by two of our ongoing research projects. The first involves The Message Assistant, an electronic mail system intended to function as a software mediator helping to control the flow of network information in the form of electronic mail. In addition to the standard electronic mail features (e.g., creating, sending, and receiving messages), this program also allows the user to create a rule base and hypertextual links that filter and organize the information in electronic mail messages. The user-defined rules and hypertext-linking features can be combined to automatically construct a hypertext that interconnects information in different messages. (For a fuller technical discussion of the user-defined rules and other features of the program, see Levin & Jacobson, 1992.)

The user-defined rules check text strings in different message fields and will activate a rule if there is a match. The message actions include raising or lowering the message priority, creating a automatic reply or forward message, and automatically creating fixed and variable hypertext links between messages. The Message Assistant can create either *fixed hypertext links* or *variable hypertext links*. Fixed hypertext links connect two messages and can be created manually by the user or automatically by the program during certain operations (e.g., replying or forwarding a message creates a link between the original message and the new message). In contrast, variable hypertext links exist only under certain conditions and are used to link messages based on multiple topics, concepts, or themes (Jacobson & Spiro, 1993; Levin & Jacobson, 1992). We refer to these variable topical or conceptual links between different messages as *message views*, with each message view being a self-contained collection of hypertext links between messages.[4] As different messages may be relevant to several different topics or conceptual areas, the Message Assistant allows the user to create *multiple views*.[5]

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[3] It is interesting to note that much of the most innovative network software development is using a hypertextual orientation either implicitly (e.g., TurboGopher's Bookmarks – which are simple hypertext links to Gopher nodes) or explicitly (e.g., World Wide Web – which creates very elaborate documents with hypertextual links to distributed network text and multimedia nodes (Krol, 1992)).

[4] We use the term "variable hypertext links" technically to describe message views as the hypertext links between messages that vary depending on the view the user has selected.

As students will typically collect a large number of messages received while they are involved with network-based learning activities, the user-defined rules and the hypertext features of the Message Assistant are intended to assist the students as they construct a personal knowledge space from this information. Note that creating such a personal knowledge space is much more difficult to accomplish with a more traditional electronic mail program that merely lists messages that have been received or sent — or it may even be impossible, given the "read-and-delete strategy" that is common among many users.

Project-based learning server. Hypertextual tools are ideally suited for structuring multiple organizing frameworks for any given set of information. This type of functionality is especially important when a wide range of people need to access and use information flexibly, as is the case with a network information server. However, merely providing flexible access to information using hypertextual tools is not sufficient to ensure that substantive learning will occur.

As we noted above, an accumulating body of research is starting to identify the theoretical and design characteristics of effective hypertextual learning environments, such as active, nonlinear student exploration of hypertext information nodes, student creation of new links in an existing hypertext, explicit depiction of important interrelationships between surface and structural knowledge components across multiple case examples, and student authorship of hypertext materials (Beeman et al., 1988; Jacobson & Spiro, 1993; Jonassen & Wang, 1993; Lehrer, 1991). In another area of research, we are investigating the application of important hypertext and hypermedia research findings such as these to the development of a network hypertextual project-based learning server. The server, currently under development, will contain a large knowledge base of science education projects, science curriculum units, and science questions, which will be coded in terms of dimensions such as underlying science principles and themes, age and grade levels, instructional tips, needed materials/supplies, duration, and so forth. The project-based learning server will also be designed to reflect current cognitive learning research into naive student models of different science topics, to suggest instructional techniques to promote conceptual change in students, and to demonstrate important interrelationships between scientific principles and concepts across different content areas. Also, the knowledge and activities in the server will be selected for their relevance to real world issues and problems.

Overall, the project-based learning server is intended to be a shared knowledge space that is structured in ways to help support enhanced student learning of complex knowledge as students are involved with a wide range of authentic project-oriented learning activities. We will also investigate how hypertextual tools for constructing personal knowledge spaces, such as the Message Assistant, can be used by students in conjunction with the shared knowledge space of the project-based learning server.

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[5] We use the term "views" to be consistent with — indeed, to evoke — the knowledge spaces conceptual model. Ideally, a teacher would use the knowledge spaces analogy with her students as part of general discussions and activities involving NLEs, and the term "views" in the Message Assistant program would simply be a subtle reaffirmation of the general conceptual model.

Conclusion

In this paper, we have presented some conceptual frameworks for the systematic development of network-based learning environments that can help students and teachers as they jointly construct personal and shared knowledge spaces. We have described a software tool for constructing a personal knowledge space, Message Assistant, and we have sketched out our initial efforts at applying similar concepts and tools to the design of distributed project-based learning servers that can be used to construct shared knowledge spaces.

For networks to have a substantial positive impact on education, "ease of use" and "universal access" are not enough. Students and teachers need conceptual frameworks to help organize their activity, they need tools that are consistent with such frameworks, and they need mediators to enable the activity. This paper describes some initial theoretical and research steps toward these goals.

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Theme Session (F6B)

Service Provision to a Distributed Professional Community: Preliminary Concerns in the JITOL Project

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Abstract

The paper explores communities of practice. It describes work on the JITOL project which is supporting remotely distributed adults in their professional development using computer-mediated communications. The paper discusses the relationship between a service provider and one community — advanced learning technology (ALT) professionals. User trials and requirements are introduced. Development of new technological tools aim to facilitate collaborative sharing and knowledge exchange in ways that more closely fit the needs of such professional communities.

Introduction

This paper relates to communities of professional practitioners. It is specifically about service provision and support to groupings of adults in their professional learning, or professional development. The paper begins with an interpretation of "community of practice." It is an exploration of the concept from a particular perspective.

The perspective derives from work on the European project JITOL (just-in-time open learning), which is supporting professional communities by the use of computer-mediated communications. A short description of the project is given. The paper then goes on to explore the JITOL professional community perspective and how we (as service providers) can offer distinctive support to a professional community. To develop appropriate and valued services requires a firm and explicit understanding of community belonging and community requirements. The user trials and requirements survey of a specific community that are currently under way are introduced.

Technological tools are also under development to enhance the existing functionality of a JITOL service. These tools are designed to facilitate new ways of collaborative sharing and knowledge exchange that more closely fit, and can be responsive to, the needs of evolving professional communities.

Communities of Practice

The term "community of practice" draws upon the research of Lave and Wenger (1991), which assessed how apprentices learned their craft, moving from positions of peripheral participation to assimilation within the community. It examined how the apprentices adopted community roles of increasing complexity and engagement.

We are aware that mechanisms already exist across all spectrums of human activity to establish community belonging. There are well-established communities with "civic" purposes such as the Society of Free Masons or the Rotary Club, as well as interest groups relating to recreational interests and sporting activities. Even within communities established for other than work or professionally related activities, there are established, often formalized, regulations and customs for the assimilation of new members.

We can also think of established groups of interest that relate to specific professions such as trade unions. There are mechanisms to facilitate professional development at national and international levels, such as the Royal College of Nursing or the Law Society. Group or communal activities are organized that individuals with a particular professional interest can join, and a community identity by virtue of membership of that professional association can then be said to exist. Some professional associations may be heterogeneous and large scale with formalized customs and regulations; others may be very specific to a specialist area within a field and exist in a very informal manner. The existence of such groups acknowledges the need for community identity. Membership may be useful because it can provide mechanisms for the dissemination of new knowledge and new practice. But it does not suggest the essential nature or centrality of membership to individual activity that Lave and Wenger's research considered.

We have borrowed from their view of practitioner communities because it is a view that explores knowledge as a communally held commodity. The term has resonance because it promotes community belonging as an interweaving of the participants and their knowledge *to* their practices and the knowledge tied to those practices. The focus of such a view shifts from the knowledge as an entity to the knowledge as a constructive interplay between a practitioner (or among practitioners) and their practice (or practices). There is a dialectic between individual and community.

To think of a community (and its knowledge) in this way emphasizes that work and learning are inextricably fused and moves us away from the traditional view of work and learning as separate entities. It is a view that recognizes that learning needs emerge as the result of practice. It recognizes that learning needs revolve around professional problem-solving activities.

We can also look at the concept from an individual's viewpoint. From this perspective we are emphasizing the strong coupling between the individual member's knowledge (and practice) and relationship to the community. The emphasis on proximity of members to each other, and to their practices, promotes an interweaving of learning and practice that allows not only the accepted skills and practices to diffuse through the community but also provides the opportunity for new innovative ways of working, to be disseminated among the community in more fluid ways.

Furthermore, the concept of practitioner communities promotes collaborative sharing and exchange of knowledge. Knowledge is not a private commodity, and the process of articulation to others can lead to more meaningful learning. Collaborative activity promotes the active construction of knowledge and engagement in the learning process and focuses on the learners as active participants in their own learning process. It also satisfies human needs to interact with others: many people work (and learn) in teams.

The conception of a *professional* community determines a blurring of roles away from prescriptive treatments as experts and non-experts, or learners and tutors, to roles of coexistence and mutual sharing of different (but individual) expertise. If we are to break down barriers between learning and work, study and practice, then we also need to break down defined roles and responsibilities.

This blurring also accords with a view of learning that shifts control more directly to the individual learner. This conforms well with theoretical principles of adult learning that emphasize the importance of autonomy and self-direction for the adult learner. Significantly, too, this shifting to an individual perspective acknowledges the value of individual and unique background experiences in adult learning (Cross, 1984; Brookfield, 1987).

Background to the JITOL project

JITOL is a three-year project partly funded within the EC's DELTA research program. The project began in January 1992, with the broad aims of developing and evaluating computer-mediated collaborative learning environments. These are environments designed for specific distributed professional communities. We are presently investigating the services and resources that a JITOL environment might consist of (for more details of the project see Lewis, Goodyear & Boder, 1992 and Lewis & Steeples, 1993).

JITOL Communities of Practice

There are four areas established as test communities in the JITOL project:

- a community of advanced learning technologists – the ALT community (people employed in the learning technology industry as courseware designers, educational technologists, etc.)

- a community of medical doctors specializing in the treatment of diabetes and patients' self-management

- a community of systems engineers working on a particular product range

- a community of bank front-line (counter) staff

While we are exploring learning environments with a broad range of practitioners, what makes JITOL distinctive is its support of distributed professional communities through the development and implementation of technological tools for interaction and exchange among the distributed members. We see interaction among the community's members as a key to the effective development of such communities. This enables collaboration and the sharing of contextualized experiences.

We are using *asynchronous* electronic communication systems (E-mail and computer conferencing) for tutorial support and learner interaction among these distant professionals. Communication in an asynchronous form not only enables flexible learning in terms of time and place but also gives autonomy to learners to organize and manage their participation, to join in discussions and to contact other learners as their need arises. This flexibility supports reflection and self-pacing. It allows the articulation of ideas and concerns to others with related interests, which would otherwise be extremely difficult for isolated practitioners. The textual record remains as a resource that the individuals involved can return to and reflect upon. Maintained as a resource for the community, it also becomes accessible to other, different, or later learners. These textual transcripts powerfully represent real learning needs and can fine-tune the growth of the community's knowledge base.

This paper focuses on support to the ALT community. We have been running a master's level modular program in the advanced learning technology field for several years (MSc Information Technology and Learning). The participants study with us part-time and are distance-based. They work in the area of learning materials development both within higher education and in commercial organizations. These people are part of a developing professional community, and we have quickly realized that their collective (but individual) knowledge and expertise are the richest resources available to us. Between and among these learners is a broad range of experiences and skills. We can therefore best support their professional development by focusing on:

- learning that is task-related, in the workplace
- learning that draws upon context and experience

To think in terms of an ALT community is really a convenient fiction. It is a concept that we are applying to a growing, heterogeneous, multifaceted population that can include courseware designers, educational technologists, and electronic publishing specialists. It can encompass HCI researchers and people developing distance learning materials. Such a broad umbrella could lead to a picture of a community that is too amorphous. It is also quite true that these various professionals may be totally (and quite blissfully) unaware of their relationship to such a community. We use the term, however, not only because the ALT professionals' unifying involvement is in the development of learning materials but, more important, because it upholds an interpretation of an area of interest (such as Advanced Learning Technology) that takes into account perspectives relating to human, social and work activity.

The ALT industry is a relatively new and continually changing field. Technological advances are ongoing. Concurrently, new approaches to using these technological tools for learning are continually being applied. There can be no doubt that it is easier to think about an organic, developing community for an evolving industry. Rules and conceptions of practices are less likely to be fixed and resistant to change in ways that may be true of other professional communities. It allows us, as service providers, to think about emergent goals. It allows the service to grow responsively to emerging needs (Goodyear, forthcoming).

The project is also supporting challenges to the traditionally formalized education of other professionals, including that of medical doctors. JITOL is supporting a group of doctors who specialize in diabetes. These doctors are exploring the development of a patient self-help therapy program. The doctors are spread across Europe and the communications network to talk to each other and exchange experiences. There is no prescribed course or learning program. Theirs is the closest example we have to a truly "open" environment for learning.

Supporting distributed professional communities is not merely about the provision of courses with enriched tutorial and peer interaction, however. Neither is it simply about establishing a communications infrastructure to allow a distributed group to talk to each other. Support implies a responsibility to the development of the community. The paper now goes on to describe our present gathering of data from the ALT community. We are exploring what services and resources we may usefully and *uniquely* provide to a JITOL community.

JITOL Service Provision to a Community of Practice

What then are the implications of taking a community of practice perspective in thinking about the types of services and resources we could provide? It is perhaps useful first to consider the two (main) elements of a JITOL environment:

- the JITOL service provider
- the JITOL participants

The JITOL service provider is defined as (part of) a university (for the ALT community) and as a technology-transfer organization for the other defined communities. For each of the communities, the service provider has a central function in building and developing the community it supports. Equally, service provision is shaped by, and responsive to, the needs and goals of the community. A synergy exists between the community and its service provider.

The JITOL participants are the people who compose a community and have roles as, for example, researchers, tutors, learners, resource managers. These roles are not necessarily fixed to specific individuals, but they help us to think about the elements that compose a community. As people, the participants are physically spread across Europe and are using the environment in response to learning or professional development needs.

At present an ALT learner becomes part of the JITOL environment by joining a module in our program of study at Lancaster University. For the duration of the course and for a period thereafter, the learner may use the facilities provided to support that learning. It also gives him/her access to the whole range of ALT resources and services currently available. These services include continuing opportunities to use the on-line conferencing for learning or social purposes, where details such as of seminars, workshops and jobs are posted.

The ALT tutors are responsible for individual modules in the program. They have responsibilities for providing on-line tutorial support to distance learners and duties to maintain bibliographic references to the subject area. Bibliographic resources are available to tutors and learners alike. Tutors have also been largely responsible for setting in place other services, such as circulating news of jobs in the field and details of ALT events, as part of a current awareness program.

Researchers have a crucial role in shaping the development of a community's practices by adding new knowledge (new learning) that will impinge upon the work of ALT practitioners. Applicability is vital to research activity. The involvement of researchers in the community allows the results of their efforts to be shared and made available to practitioners. There are mutual benefits in this: the researcher can immediately share new knowledge with practitioners and be informed by practitioners of real needs and new problems. Importantly, too, the practitioners are able to communicate the outcomes of research to others in ways that give the community and its practitioners a sense of ownership of the research effort. It again gives resonance to the blending of learning (or research) to practice.

Understanding a Community's Needs — User Trials and User Practice Assessment with ALT Professionals

JITOL is running a series of large scale user trials among and across the different communities. The first of these is currently under way, using stable communication technologies (electronic mail and computer conferencing). Analysis of the data emerging from the first trials will be used to inform future iterations of the JITOL environments.

More locally, our understanding of the ALT field and its community comes through several years of running our MSc program, in which we have used formative evaluation sessions with course members. These methods have given us useful clues to potentially valuable services and resources that a JITOL environment could uniquely offer to the ALT community.

Comments from practitioners have enabled us to build up services such as disseminating news of research projects, circulating job advertisements, running a regular newsletter. These services are in place to course members (both past and present). From this we already suspect that one of the keys to making a JITOL service unique is by adding *value* to the disparate services already available to a community.

Added value may be achieved by integrating services, but it may arise by adding "extra worth" to the resources. Ideas that we have in mind include providing annotated commentaries on relevant articles or texts, independent reviews of new products, and abstracts of current journal contents. We know there are numerous journals that impinge upon this field, a selection of databases to access, professional associations that the ALT professional can join, etc. These are all mechanisms that currently exist to support professional development needs. But how do individuals tap into the appropriate resources or services for their particular need at any one moment? How does that person find the appropriate resource or service? How does he/she gain a hype-free assessment of a new product? Or a review of a new book?

Relevant and appropriate service provision requires a deep understanding of community membership, at all levels of involvement. The JITOL (ALT) user trials are assessing learners and tutors involved the MSc program. We are also assessing current practices of ALT professionals beyond the MSc program. This is among researchers and professional groups who have specific interests within the ALT field.

We want to know about present patterns of seeking information, present ways of keeping in touch with technological developments, and ways of making contact to others in the community. This will help us to provide more appropriate JITOL services and will aid us in prioritizing the most useful services we can offer. It is also a means to promote a JITOL-like service to the larger professional community.

Technological Tools to Support Distributed Communities

We are also conducting small-scale trials of newly developed technological enhancements to the established system components. The first of these trials concerns a communal hypermedia database system that will be tested within the ALT community.

This system aims to integrate the features of computer-mediated communication (E-mail, conferencing, etc.) with a hypermedia database. Integrating different tools or facilities into a seamless environment offers a number of advantages to users. For example, they have to learn only one system. Transfer of material from one area of the environment to another is simplified. This seamlessness and ease of use are essential. The system is after all an enabling technology to support professional learning and communication.

The database will consist of materials or resources being brought on-line and will grow by the inclusion of material from the conferencing activity — the transcripts of discussions around professional problems and organized in the database around thematic spaces or topic areas. The database has been described as an "an evolving knowledge base" (Lewis, Goodyear & Boder, 1992).

One feature of this communal *hypermedia* system is the facility to allow individual and adaptable structuring of the information or "notes." Notes are designed for jotting down ideas, posing questions or problems. Comments may be linked to notes. Groups of notes (and their comments) can be organized into note sets, in which they are related by a common theme, thus imposing a hierarchical structure. However, a strict structuring can be awkward to traverse, and it is not always easy to find the appropriate note set. So the idea of associations is introduced.

Associations provide a user-defined view of the information. A single association can contain multiple links to note sets or to individual notes. An association can also be assigned status (private, group, public), as can both notes and note sets.

This facility to privately annotate a set of discussion notes permits reflection before articulation to others. It therefore also supports individual control and a very personal exploration of professional issues. The links or associations may be restructured as an individual user's knowledge evolves, their perspectives change through collaboration with others, and their role in the community evolves.

Summary

JITOL has the distinction of exploring the collaborative exchange of contextually oriented knowledge among distributed professional communities.

Our master's program has provided a useful mechanism to learn about one particular community. If we are to pursue the concept of practitioner communities, the project must develop a service provision model based upon open learning principles, where there is no distinction between work and learning and no fixed points for periods of study. How realistic or desirable this is, is uncertain.

What JITOL does aim to achieve is a computer-mediated collaborative learning environment where the locus of control is not fixed but shifts among the participants. This transfer and fluidity of control mirror the kind of shifting that occurs in natural dialogue and takes account of individual experience and expertise. JITOL is aiming to acknowledge in its structure that a professional community is a complex space with forces at play both in different directions and at different levels.

Service provision to a community is more than the availability of programs of study or communications networks. Practically we see it as the provision of distinct aids (whether human or material) to professional development needs through a coherent source. It is also about aiding the development of an environment that can be responsive to the changing roles and complexity of professional needs as the community (and its knowledge) evolves.

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Theme Session (F6C)

Alice: Shareware for Educational Telecomputing

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Abstract

The Alice project is designed to further collaborative student activities, particularly in mathematics and science, by simplifying the use of networks for effective communication of ideas expressed in text, numbers, and graphs. The project intends to encourage the widest possible use of this technology and its adoption by private and public agencies offering network services. Information about how to obtain the software and how to participate in the project is provided.

Background

TERC's Alice testbed project is one of four projects funded by the National Science Foundation to advance the state of the art in educational networking and to help decision makers at all levels base investment decisions on a more informed and empirical basis. Now in their initial pilot phase, the testbeds are developing and testing applications, services, and technologies of computer and communications networks in support of innovations in science and mathematics education. These testbeds are collaborations among industry, higher education, K-12 schools, and other institutions to create networking testbeds.

The testbeds are designed to enable teachers, students, scientists, engineers, educational researchers, and educational administrators to work together to develop know-how and determine benefits and costs of using the computer-communications networks and associated distributed resources to support innovations and reforms in education and for learning of people at all ages in many different kinds of settings. The innovations address most key aspects of education: professional development for teachers, classroom science and mathematics instruction, informal science education, teacher preparation, assessment of student learning, project-based science learning, curriculum development, school restructuring, and state systemic initiatives. Knowledge provided by the testbed experiments is expected to help decision makers at all levels of government, community, and industry to make informed investments in networking technology and information infrastructure for education.

The Alice project is creating an agenda for research, development, and implementation that addresses some of the key aspects of infrastructure and educational innovation that support educational reform. The project specifically addresses:

- educational applications
- organization of educational services
- technological tools to support the applications and services
- telecommunications infrastructure

The Alice project is beginning to establish the institutional, instructional, and technological conditions within which a wide range of experiments and empirical research agendas can be carried out. It has a particular model of how to use telecomputing in education and how this kind of use will be disseminated to large numbers of students. This model influences the software design, the ways it is tested, and the planned dissemination model.

The project is creating the software and institutional arrangements needed in several phases. The current phase explores these technologies and institutional relationships using prototype software and a selection of collaborators. The next phase will take what is learned from the current phase to create software and launch educational services that will have a very large impact.

Two Faces of Educational Telecomputing

There is a difference of interests, needs, attitudes, and values between university and pre-college users of telecomputing which makes communication between the two groups difficult. This situation is exacerbated by the greater technical experience and general volubility of many university-level spokespeople which make it difficult to hear pre-college voices.

Internet grew out of the computer science research community, where real hackers use command lines, not menus. The broader academic community tolerates the resultant hostile user environment because professional communication and joint publications are the lifeblood of the academic culture. In addition, a high degree of technical expertise is available on most campuses, so there is usually someone to turn to for help over the more incomprehensible aspects of using academic systems. Finally, the costs of telecomputing are invisible to most faculty, covered by complex combinations of overhead, research grants, donations, and unaccounted time.

In contrast, a high level of collegial communication is not important for most pre-college teachers, especially after a grueling day of classes. Furthermore, pre-college teachers are very cost-conscious and have few options for covering even the smallest new or unexpected costs. Thus, college-level faculty do not understand why all teachers do not jump on the Internet bandwagon, and the pre-college teachers cannot see the point. A conflict of culture results here that too few university faculty try to overcome.

Providing educational answers without understanding the needs being addressed can be perilous. Because such large sums are at stake, there is a great possibility that education will be used instead of being served. The easiest solution for those with the technology is simply to apply the technology as-is. Hence, there is the potential of saddling education with the wrong technology and missing the real contributions that telecomputing could make. There is also the potential of showmanship that solves no serious educational problems – for example, the free supercomputer at the high school, used by only a few students and not provided with maintenance funding. Educators have limited resources and even less patience for hollow efforts which leave the huge, depressing problems of public education untouched.

Many advocates of telecomputing are entranced by the technical capacity of networks and forget to ask how that capacity can be applied to meet the needs of pre-college teachers. This attitude is illustrated by the concept of "exploring the Internet" that is often advocated as the chief use of networks at the pre-college level. While it is exhilarating to read the card catalog at U. C. Davis, to spot the DNA archive at Brookhaven, and to pick up some curriculum material in Huntsville, this capacity is not particularly useful for most teaching situations. Clearly, the potential is there, and outstanding teachers and students are exploiting it. But this kind of resource is untamed and, therefore, not yet ready for large-scale classroom use.

The situation was similar when microcomputers were first introduced to schools in the 1970's. With BASIC built in, they could be programmed by teachers and students for interesting educational applications. This potential was exploited by a few, but it required the development of packages of full-fledged educational applications with software, curricula, and teacher-support material distributed through a variety of commercial and nonprofit channels for the potential of microcomputers to be realized by significant numbers of teachers and students.

The Alice project has its genesis in successful efforts to reform mathematics and science education with approaches that are broadly applicable and generally acknowledged as needed. These approaches can be described as a model for collaborative inquiry. Networking is needed to support this model and can be a critical ingredient in its broad implementation, given the appropriate technology and commercial arrangements. We are particularly interested in exploring the kinds of organizations that can provide services to such organizations that support student collaborative inquiry; we call educational service providers. The Alice project is designed to provide prototypes of the needed technology, to begin to stimulate the development of educational service providers, and to study the necessary technical and commercial arrangements.

The Collaborative Inquiry Model

I believe that the worst thing that has happened to science education is that the great fun has gone out of it...Very few see science as the high adventure it really is, the wildest of all explorations ever taken by human beings, the chance to catch close views of things never seen before, the shrewdest maneuver for discovering how the world works. (Thomas, 1981)

To convey the high adventure of science, we need to engage students at all levels in scientific investigations, which should be not just another requirement but the *central goal of science instruction*. The science facts we teach in school are far less important than imparting a love of science and the desire and ability to acquire more science learning. In most science instruction a key ingredient is missing — collaborative inquiry.

The new science standards, while not yet complete, will certainly base their models for reformed science education on the **centrality** of student projects and investigations. The draft AAAS *Benchmarks for Science Literacy* of January 1993 states this clearly and succinctly at the outset:

From the very first day in school, students should *do* science–not study science. (p. 3)

The February 1993 draft of the NRC *National Science Education Standards: An Enhanced Sampler* echoes the same idea:

The key is for students to experience doing science themselves in ways that mirror how science actually gets done and that emphasize the mores of science. (p. 11)

The central thesis of both standard efforts is that students must learn science through the process of science investigations and inquiries.

Student investigations are an essential part of the total science experience...The investigations help students to learn how *science* works. (*Benchmarks*, p. 9)

> Inquiry is a critical component of the science curriculum at all grade levels and in every domain of science. (NRC, p. 55)

The investigations envisioned form a new strand that spans kindergarten to twelfth grade starting with simple messing around and concluding with serious collaborative scientific research:

> Year by year the investigations should become more ambitious and more sophisticated. Before graduating from high school, students working in teams, preferably self-formed, should approach [investigations], estimate the time and costs involved, calibrate instruments, conduct trial runs, write a report, and finally, respond to criticism. (*Benchmarks*, p. 7)

The new standards are an integral part of the more general school-reform movement, with its increased emphasis on genuine learning, student-directed, collaborative projects, and alternative assessment. This vision of science education is far different from much of current practice and represents a revolution in how science is taught. If adopted, it could reverse the shortcomings that Thomas noted above and put the fun and high adventure back into science.

Research at TERC has demonstrated that an approach that emphasizes student investigations can be accessible to ALL students, belying the common misconception that only gifted or strongly motivated students can learn through project activities. For instance, TERC staffers Warren, Rosebery, and Conant (1989) have shown that project activities are extremely effective with Haitian Creole-speaking language-minority students in "basic skills" programs who test several grades below level. In other TERC research, computer-based, project-oriented materials have been shown to be effective for many students with mild learning and behavior disorders. The TERC Star Schools project registered some of its best successes among students who were otherwise performing poorly; cooperation, interest in science, leadership, and performance improved for all students (Weir, 1990).

When the new science standards are promulgated, there will be widespread demand from schools for assistance in offering genuine science, as the British found when the National Curriculum with its increased emphasis on inquiry was first implemented. If mechanisms are not in place to respond to these demands, the consequences could be grave. Some of the problems associated with the reforms of the 1960's sprang partly from the idea that schools had to move away from the old without having a clear image of the new. As a result, many relaxed old standards but could not substitute new values and expectations. Structured, disciplined classrooms in which there had been some learning too often became chaotic with less learning. The same could happen again. In response to the standards' call for increased student inquiry, many schools might offer poorly conceived activities. The final result could be the broad rejection of the reform effort and a return to our present, inadequate form of science instruction.

Alice has evolved from needs identified through years of experience in fostering collaborative student inquiry. This kind of activity assumes a model of the educational environment that places requirements on the telecomputing system. The model for educational innovation that the Alice testbed project is supporting and implementing has the following characteristics:

- Several (or many) individuals and groups form a community to work on a common problem or agenda. Members of the community include learners, teachers, scientists, volunteers, and facilitators and might be at home within a school, across a district, or throughout the world.
- Some members of the group (educational service providers) serve as intermediaries or organizers for the community. This role could be played by an individual teacher, a curriculum development project staff, a state education agency project, an R&D organization, a science museum, a commercial publisher, or perhaps even a special service group of a communications company.
- The community establishes a common purpose and a set of questions and agrees upon standard ways of reporting its individual findings to the rest of the community.
- The community may wish to form subgroups, spawn new activities, or reorganize periodically into new groupings in response to either planned or unplanned changes in the activities.
- The work of all the separate groups within the community is combined into a community database(s). The information being shared may include text, formatted files, numeric or categorical data tables, graphs, maps, drawings, or pictures.
- The community databases are used for analysis, question-generating, and interpretation by all the individuals and groups in the community, and the resulting knowledge and reflections are shared with the community as well as with others outside the community.
- Computer and telecommunications networks serve as an important form of communication among the members of the community.

This model is closely linked to the current educational reform effort because it supports an increasingly wide range of innovations in education, for several reasons. It gives learners and teachers a supportive community as they struggle with the challenges presented by new ways of learning and teaching and investigating; it gives learners and teachers an audience for their work; it enables sharing of resources and expertise among people of diverse backgrounds in different locations and institutions; it promotes development of skills in collaboration; it provides a motivating context for development of discipline and skill in inquiry and reporting; it enables rapid dissemination of innovation; it leverages the efforts of a small staff such as a small group of innovators in a state or school district educational agency or educational research organization.

Despite the potential and sometimes compelling power of this model to support and facilitate innovation, the model also has many pitfalls and barriers to success. There is always an overhead cost to collaboration. If the participants are from different countries and cultures, there are barriers of language, customs, expectations, school calendar differences, curricula, and the like. Establishing standards for information gathering and reporting is time-consuming. Combining and sharing the information gathered by collaborators require effort and a high degree of cooperation. Collaborators must be able to share ideas easily, comment on work in progress, and edit messages within groups that can shift as interests and schedules change. A common capacity to analyze data and to share the results of that analysis is needed.

The very nature of investigation and real-world inquiry demands skills and concepts and roles that are mostly unfamiliar in typical classrooms and curricula. The technology needed to support this effort is too often threatening and unfamiliar. These considerations imply the need for some entity to provide centralized services for the collaborators–services which must be streamlined, efficient and low-cost.

The Alice project is designed to explore an approach to solving these problems that could offer a rich variety of telecommunications-based services to education in a way that could be self-supporting.

The Educational Service Provider Concept

It would be wonderful if all educational services were free, and the research-based networks are designed from this perspective. Within Internet, it is difficult to charge the end user for telecommunications use — universities provide these services for their community in the same spirit as they provide student and faculty free access to libraries. And while some Internet providers are granting pre-college access to the Internet, this cannot be a solution in the long run. Someone must pay the real costs of pre-college access, and it is unlikely to be the universities.

The potential cost of pre-college telecomputing use is frightening if you think about the consequences of extending university-level use to the pre-college audience. There are 42 million pre-college students in the U.S. If a fraction of these students made extensive use of Internet services, the existing system, and probably any planned extensions of it, would be brought to its knees. However, the problem becomes more manageable when pre-college needs are viewed from more realistic perspectives, with students working off-line and restricted to modest file sizes. Suppose, for example, every U.S. student generated 10Kbyte of traffic daily. This would generate about 5Gbits traffic daily, which, spread out over 24 hours, would come to 50Mbps average total communications load. This would be small compared to the planned Internet system which envisions multi-Gbps capacity.

Of course, limited universal connectivity would be meaningless if it gave no educational benefit, if only high-bandwidth educational applications were of value. But that is not the case. With careful educational and technical design, limited telecommunications offers a great deal to education. Our highly successful Kids Network transfers only 1Kbyte per child per month. There are many possible applications that might need to transfer up to 10Kbyte per student per day, but if the users forswear pictures, sounds, and videos, this can be a practical maximum. Exchanging a bit-image picture requires 10 to 100 times as much, and a video is more extravagant by another factor of 100-1,000, requiring much more capacity.

Of course, it would be desirable to have no limitations to students' access to technology, but pictures, sounds, and videos are not absolutely necessary and are certainly not achievable for ALL students this century. The educational telecomputing system we design should be able to support higher levels of performance for those who need it, but its primary design goal should be universality, and that requires clever use of limited bandwidth on the order of 10Kbyte per student per day.

There are costs associated with educational telecommunications that go far beyond the costs of information transfer. For instance, many teacher networks flourish only when there are moderators on-line to facilitate the conversation. This represents a human cost which can easily exceed the telecommunications cost. One year MIX, the McGraw-Hill Information Exchange, was the leading provider of educational telecommunications; the next year it was out of business, largely because it provided generous and effective moderator services but could not generate sufficient revenue to pay for them. Telecommunications provides the infrastructure over which pre-college educational services can be delivered; some of these services are quite expensive and need to be offered on a fee-for-services basis, which is not compatible with the Internet design philosophy.

There are two possible ways of funding educational telecomputing services: either the state–broadly interpreted–must pay, or the services must be commercial, with the end user paying. The educational telecomputing system that is set up should accommodate both means of funding. The end user should be able to select some state-supported activities which are free (to the classroom teacher) and others which require subscription or other form of payment. It seems obvious that, just as the medium of paper supports both free, state-financed curricula and commercial texts, so too must the telecommunications medium support both. Were we to rely only on state funding, many of the possibilities of the medium would be overlooked, and the vitality of competition would be lost. Were we to rely only on competition, innovation would be lost and risk-taking curtailed. Most of widely used educational telecomputing projects – the NGS Kids Network, the AT&T Distance Learning Network, the various weather services–started with state funding and are now on a commercial subscription basis. Clearly, the educational telecomputing infrastructure we build must continue to support both options.

We have coined the term "educational service provider," or ESP, to refer to the organizations making up this infrastructure, whether they are public or commercial. We imagine an ESP will offer schools a collection of human and technical services combined with various materials. The human services might include recruiting scientists, providing moderators, solving technical problems, grouping students and classes, analyzing data, and publishing newsletters. The technical services might include electronic mail and mailing lists, electronic conferences, databases, data collation and turnaround, archiving, and class registration. Materials include teacher guides, student material, lab equipment, supplies, and software. These services and materials have associated costs, and, therefore, access to them must usually be limited by the registration sometimes associated with direct charges.

The ESPs could be drawn from a range of organizations: school districts, traditional publishers, RBOCs, electronic publishers, state educational agencies, commercial network providers, educational research and development groups, computer manufacturers, and others. Some ESPs will provide all the services themselves; some will subcontract some or all of the work to others. In particular, the technical network services might be outside the expertise of many ESP organizations, possibly giving rise to technical service organizations to meet the technical needs of multiple ESPs.

The Alice Project

A key ingredient in this vision is a collection of software capacities which support collaborative student inquiry and educational service providers. This technology would meet the following goals:

Interconnectivity. Students worldwide need to be able to communicate using whatever forms of telecommunications are available–Internet, Bitnet, commercial and non-commercial services, even mailed disks, if necessary–using the widest possible range of computers.

Collaborative workgroups. It should be easy to set up various workgroups, share files of various kinds within workgroups, and edit these files.

Data sharing and analysis. To support mathematics and science, the technology should make it easy to share and update reports containing text, data, graphs, drawings, and maps and to analyze these data in ways appropriate to the pre-college level.

Database functions. Collaborations require various server databases, especially ones to which members of a workgroup could contribute.

Management functions. To reduce the costs of offering network-based services, ESPs will need a variety of registration, monitoring, and automatic mailing functions.

The long-term goal of the TERC Alice project is to develop, test, apply, and disseminate a software environment with these characteristics. This objective needs to be accomplished through the development of an infrastructure, demonstration projects, and dissemination efforts. An ambitious effort is required to develop user and host software, to encourage the development of educational applications that use this software, to establish testbeds consisting of users and service providers, to modify the software as a result of user input, and to evaluate the entire process.

The need to support project-enhanced mathematics and science instruction for all students has led us to six design requirements which effectively define the Alice software:

- Good user interface. All functions must be intuitive and easy to use.
- Beyond text. Graphics and data must be easily shared on the network.

- Support of commercial services. Packaged educational services must be available.
- Networks services. Mail, structured bulletin boards, and database access are needed.
- Interconnection. Educational users should be able to reach each other through Internet.
- Low cost. Telecommunications and software costs must be minimized.

To support commercial services, one needs host computer functions that control access and, possibly, support sub-accounts. We would like to see many commercial services such as the NGS Kids Network, offered over networks using Alice technology. If there were enough of these educational service providers offering interesting network-based activities, there would be a powerful incentive for teachers and schools to get connected. The common technology would simplify teacher-support costs and reduce wasted student and teacher startup time.

One of the consequences of keeping costs low is to support the batching of student messages to minimize school connect time. While direct connection should be supported, cost considerations demand that the primary access of educational telecomputing to the network be off-line. The educational telecomputing platform must be designed to take advantage of these huge potential reductions of cost.

The user software needed would be an integrated package capable of creating and communicating editable documents containing text, graphics, graphs, a simplified spreadsheet, and a mapping utility. Ideally, this package would run on all the computers commonly found in schools, and would operate similarly across platforms. We would like to build this software using a graphical user interface that could generate code for DOS, Windows, and Macintoshes.

The Alice server software should be able to:

- Provide user access to the network, using both dialup and direct connections.
- Provide mail, database, news, and structured bulletin board services.
- Forward, receive, and buffer messages between Alice servers over Internet.
- Mirror bulletin boards and databases established elsewhere.
- Give users direct access to Internet.

We also need a large dissemination effort in partnership with states to reach a significant number of students and teachers by the end of the project.

Alice Phase I Project

The first phase of the proposed work has been funded to permit us to undertake the beginning of the development of both the user and the server software and the infrastructure needed to study the feasibility of the Alice dream. In order to work with the available funding while meeting accelerated deadlines, we dropped the support of MS-DOS computers and greatly reduced the functionality of the initial host and user software.

The strategy of this phase of the project is to study the feasibility of the Alice solution using a limited audience and prototype software. Our goal for this first phase of the Alice project is to evaluate our strategy by implementing prototype software, creating testbeds consisting of ESPs and users in schools, and studying the resulting mix. From this work a much clearer picture will emerge of the needed technology and infrastructure.

The Alice project is currently approximately halfway to the completion of the goals of the first-phase funding. Version 1.5 of the user software has been released and is being adopted by a number of testbed projects. Many groups have expressed interest in collaborating with the project by becoming testbeds and giving feedback to the design process. An initial version of the host software that supports a number of kinds of connection and automated data turnaround was completed over the summer of 1993.

To achieve the aims of the original vision, considerable additional work will be needed to redesign and rewrite the software in light of the findings of the current, first phase, to assemble a range of educational resources using this software, and to disseminate the resulting material.

The Technology

The technological components of the Alice testbed are of three kinds: applications, management functions, and telecommunications.

Applications. Each individual or group participating in a community uses a personal computer to organize and analyze information and communicate with the other members of the community. The Alice project provides an easy-to-use integrated suite of software tools to support these activities. The tools include a simple word processor, data table, graphing and mapping utilities, electronic mail, and telecommunications functions. This software currently runs on any Windows-compatible PC or any Mac with 2 MB (system 6 or 7). Alice also provides complete file interchangeability Windows <—> Mac so that a community may have diverse hardware.

While not competing with integrated business tools, the Alice user software provides educators with a nice set of tools that facilitate cross-platform network-based collaboration, especially in mathematics and science. Although not sophisticated, the word processor is not the sort of line-oriented editor found on most networks that discourage collaboration because of the difficulty of dealing with linefeeds at the end of each line. Its ability to show suggested additions and deletions using bold and underline enhances collaboration.

The data analysis tool is similar to a spreadsheet but easier to use because it is column-oriented. We have found that spreadsheets are unnecessarily complex for most pre-college applications and, therefore, require an unnecessary amout of time to master. Data are entered into the Alice analysis tool on a rectangular grid or in a special form derived from the grid. The data can be analyzed and displayed in a variety of graphical formats, including line graphs, bar graphs, pie charts, and a map. The map can be scrolled and zoomed by a factor of 256. Future plans call for data to be displayed on the map as points, area fills, or isopleths. Additional parts could be added in Phase II of the project and by interested developers. One high-priority application would be a simple graphics editor integrated with the mapping utility. It would also be highly desirable to have an integrated Alice document consisting of any number of these various file types arrayed serially.

Because the full range of Alice file types can be shared over the network, students, teachers, and scientists can engage in collaborative work involving text, data, graphs, and maps. All users have a full complement of editors for these file types so they will not be simply passive receivers of information, but contributing collaborators to document development and refinement. By going beyond the current text-only limitation of most telecomputing systems, it is possible to communicate far richer information that is much more meaningful to students.

Management Functions. We assume that one of the members of the collaborating community uses a computer to compile and disseminate the information produced by the participants, maintain project records, manage the project, and so forth. The Alice project is creating a replicable 386/486-based PC-UNIX-based server with a set of software tools to support these management functions. Commitment to standard file formats RTF, WKS, CSV, will allow broad interchange with other PC/Mac tools and Internet-hosted data.

There are two classes of management software functions that we consider essential to the success of our model: administrative and academic. The administrative functions simplify class and student registration, handle routine messages to users, track messages, and run the system. We have insufficient resources to do more than specify which of these functions are desirable and make a start at a prototype designed to address the most pressing problems.

The academic function we are focusing on concerns data turnaround. We are in the process of developing an open database that any client can create on a server where participants can deposit their observations and read the accumulated data from all contributors. A data consolidation server will provide mail-mediated submission and retrieval of community data and other data resources known to or moved to an Alice server. This seems to be key to facilitating teachers' downloading data generally and other schools' data (which most teachers without Alice currently do not do). Alice will also automate and simplify the role of the community member who consolidates, or turns around, data. Alice version 1.5 supports automatic data contribution and consolidation.

Telecommunications. The goal of the Alice project is to make it possible for anyone anywhere to participate in a networked learning community. The computers used by the members of the community must be able to communicate with the computers of all the other participants. The method of transport is electronic mail. Each participant must be able to use the most convenient, lowest-cost method of telecommunications available to him/her, and the Alice tools are designed to make the telecommunications functions nearly transparent to the user. To test the range of applicability of this approach, the Alice testbed includes participants from a variety of different telecommunications contexts and networks: full period IP-connection, SLIP, UUCP, TENET, IGC, FrEdMail, FidoNet, Sprintmail. Commitment to Internet standards: Alice transports all Alice mail and files as standard RFC 822 Internet mail messages. This means that anyone who can originate and receive RFC 822 mail can participate in the community; anyone who is Internet mail-connected or mail-gatewayed can participate. In particular, non-Alice users (e.g., researchers on UNIX systems) can exchange mail and files with Alice users. Alice will work with its own scripted terminal-host automated login/mail transfer mechanism but will also be used in conjunction with Eudora, GUIDE, et. al. and other client/server models using a POP server; for the testbed TERC will operate a POP server and various partners will also put up a POP server.

Educational Partners

Our primary concern is to ensure that Alice supports the widest possible range of educational applications that fit the collaborative learning model and its dissemination through ESPs. In order to ensure this, we are collaborating with a number of organizations that will create and deliver network-based educational services using project technology. This section describes the work of major partners currently with the project.
Partners provide two distinct functions: generating materials to be used in classrooms and providing connectivity to classrooms using the materials. We plan to work in a sufficient variety of contexts that we understand how Alice technology can support both, potential ESPs and connected classrooms. We hope that for the first time, the common technology will break down the barriers between projects and users, that classrooms will have a number of network-based activities from which to select, and that ESPs will have a larger number of potential users using the same technology.

Since network-based learning/teaching communities usually cut across traditional organizational boundaries, new kinds of organizational arrangements need to be made for creating, facilitating, and sustaining these communities. The Alice testbed includes a range of such entities.

NGS Kids Network®. Under separate funding, TERC is developing four curriculum units and a core package for the middle school implementation of NGS Kids Network®. The curricula go through an extensive development and review process, including field tests in approximately fifty sites throughout the country. The four curriculum units deal with soil, sound, water, and the human body. A critical part of the field test is the relationship between TERC and National Geographic, especially in the area of marketing. Some of the issues being dealt with in the Alice project are (1) resolving how to collaborate on the server, (2) whether and how to incorporate improved maps from NGS, and (3) the degree of compatibility between standard Alice and NGS Kids Network software.

The field test sites used a pre-release version of Alice in the spring of 1993, with a manual data turnaround. The manual has been adapted to be Kids Network specific (instead of generic Alice). In the adaptation, several ideas for improving the manual were proposed. Further manual changes will take place during the development of the "Core Package," which includes the software, manual, tutorial, and other support materials for the teachers. An additional field test using Alice software is planned for the 1993-94 academic year.

Global Lab. The Global Lab project is a worldwide environmental research project developed and implemented by TERC. The project has 100 schools more than 25 countries engaged in collaborative student-based research. Countries involved include Canada, Japan, Italy, Russia, Denmark, Greece, Jamaica, Indonesia, Germany, Argentina, Czechoslovakia, Zimbabwe, Australia, New Zealand, Mexico, Qatar, Saudi Arabia, Estonia, Spain, and Poland. Each site selects a nearby location that is of environmental interest. Each site explores various aspects of its selected location, posing questions, collecting and analyzing data, and sharing the data with other sites. Some aspects of the research involve collecting common data for analysis by all members of the Global Lab project. For this project, TERC has also developed specialized, yet inexpensive, instruments, such as the total column ozonometer, which uses surface measurements to provide vital information about the ozone layer in the upper atmosphere.

Global Lab field tested the Alice software in the spring of 1993. Some features of the software are specially designed for Global Lab, including automatic communications with its server, EcoNet.

EPA Wetlands. Nebraska Department of Education received a grant from the U.S. Environmental Protection Agency to develop and implement a wetlands unit using both computer and video telecommunications. Although funded through Nebraska, it is a national project, with twenty sites, ten in Nebraska and ten in other states. This project is closely related to a statewide initiative to connect Nebraska schools to Internet, a technical initiative which is moving along well in terms of both the technology and the broad administrative support it has achieved. Part of the political context is that Senator Kerrey is enthusiastically supportive. A key feature of this project is that satellite video telecommunications will also be used.

During the spring of 1993, a group of teachers and staff of the Nebraska Department of Education developed a draft curriculum for the wetlands project. In June, TERC staff traveled to and worked with the Nebraska group to help them refine both their general Internet plans and the specific wetlands curriculum. This also included important discussions on the impact of telecommunications and inquiry-based collaborative learning on teaching and learning. After submitting recommendations for revising the curriculum, Nebraska is now the prime force in incorporating some of the recommendations and finalizing the curriculum.

Nebraska is also interested in other projects using telecommunications, such as student access to and analysis of NASA images.

Texas. Texas has been a leader in educational telecommunications. TENET (Texas Education Network) is an important network, broadly used by schools in Texas. Connie Stout, of the University of Texas, runs TENET, is active nationally, and has been in contact with TERC to be part of the Alice testbed. She has provided us with several names, including technical contacts, the head of Texas' SSI project, and the regional educational service centers.

TERC has had some subsequent phone contacts with Texas. There is definitely interest in doing something with Alice; it is not yet clear what the curricular focus should be. This means that we can be active in this early stage to help define the focus, through the overlap of some of the state's educational priorities and the power of Alice and educational telecommunications. In our discussions with them, they mentioned such things as access and equity issues, NCTM, Project 2061, Texas Scope and Sequence, "Essential Elements". They also mentioned the importance of the five Regional Educational Service Centers and the existence of eight "Renaissance Schools" which are the focal points for some educational initiatives. Bilingual education was also mentioned.

TERC's collaboration with Texas might proceed through an examination of the Texas Scope and Sequence, Essential Elements, Renaissance Schools and bilingual education, which seem to be rich sources of ideas. It also might make sense to involve Global Learning Corporation's World Classroom, since it is based in Texas.

Texas has suggested that TERC meet with the director of the SSI project, the regional curriculum and technology coordinators, and others at a statewide meeting on August 23 to explore these ideas in person. We should get some of the documents and have further discussions with various key people in Texas to find out more and to lay the foundation for the meeting. We also need to initiate discussions on the connectivity issues.

MCET – Creative Physics. Bob Tinker is doing a hands-on, live, distance learning course, "Creative Physics," with students throughout Massachusetts, via MCET's statewide interactive video network (Mass LearnPike). This year Bob will enhance the activities, using Alice and computer telecommunications.

The course is a hands-on project-oriented series of thirty broadcasts designed to supplement a wide range of physics, physical science, and technology courses. It can be used as the laboratory part of one of these courses or as the centerpiece of a complete course devoted to student project work. The course will involve students in seven projects led by "Dr. Bob." In the process of doing the projects, students gain essential experimental skills and build valuable instrumentation for the school. The projects have been selected to illustrate the major topics in physics in the order usually covered in courses, to develop measuring capacity, and to build student sophistication and independence. Three of the projects have an environmental focus and offer the possibility of engaging students in important scientific studies of the environment.

MCET is actively trying to change from the current LearnNet system for computer telecommunications to one that can support many more users. When this becomes possible, it may be feasible to shift much of the interaction now provided by expensive live production to telecomputing-based interaction around.

MCET has been meeting with TERC and others to explore how to do this in collaboration with statewide partners. Also part of the context is that Massachusetts has funded a planning effort to establish a statewide telecomputing network. Unfortunately, MCET's needs are urgent and cannot be put off the year or two that the state-funded planning effort will require.

The Princeton Seismic Network. Princeton University has recently received a grant from the National Science Foundation to place seismic stations in schools, to interconnect them, and to incorporate their study and data into the middle and high school curriculum. There are only 100 high-quality seismic sites in the world. New, inexpensive ($500) instruments enable a high-density grid of sites to be established, and schools are in many ways ideal locations. This is a tremendous opportunity for students to contribute valuable data to scientists and to actively participate in data analysis.

Princeton has some powerful software for analyzing the seismic traces and showing the location of earthquakes using different display techniques. It is not yet clear how Alice might interface with the display software. Perhaps Alice might be the vehicle for communicating the data to and from the schools, with import from the instruments and export to the display software.

TERC's roles include work on the networking and on the MBL technology. This function needs to be further defined, and a budget submitted to Princeton. The curriculum will be developed by Cecilia Lenk at Tom Snyder Productions. This arrangement enables us to further explore the relationship with a commercial publisher.

World Classroom. World Classroom is a commercial educational telecommunications project. Using generic telecomputing software, students participate in organized sets of activities, such as "Eco-News," "Whole World Almanac," "One Day in My Life," and "Young Engineers." Each unit includes a teacher's guide and specific activities for students to do via the network. There is a focus on interaction among schools, global connectivity, curriculum enhancements, and interdisciplinary activities. Next year, the project anticipates serving several hundred schools in fifteen countries.

TERC has been in contact with Gray Carry, the president of Global Learning Corporation, which develops, publishes, and markets the World Classroom. Global would like to be involved as a testbed and has sites available. We have not yet discussed how to work out the details; but it is likely that several of their units have data sharing which could be enhanced through the analysis and display capabilities of Alice. Because Global Learning is based in Texas, it might become involved with the Texas testbed activities.

Other Collaborations. Many other organizations have approached TERC with interest in collaborating. We do not have the resources to respond to all, and so we will select up to a total of eight in order to have a representative set of potential ESPs.

Testbed Issues

We have identified several major areas of concern that will be the focus of our research agenda. These include educational resources, teacher support, user support, and educational outcomes.

Each community or project needs supporting instructional materials, activity guides, data, tools, and the like. Who develops them? Who pays for the work of developing them? Who owns them? Who maintains and distributes them? How are these products and services paid for?

The Alice testbed will include a range of different approaches and circumstances concerning these issues. Some of the projects will be teacher-initiated with no formal support; some will be teacher-developed with support from state education agencies and/or federal grants. Federal agencies and programs supporting the work in the testbeds include the National Science Foundation State Systemic Initiatives, other programs of the NSF, the Environmental Protection Agency, and NASA. TERC developed the Global Lab and Kids Network materials with NSF funds. The National Geographic Society is a nonprofit publisher of the Kids Network. NGS may also create an improved set of map data to be designed into the Alice suite of tools. MCET, the Massachusetts Consortium for Educational Telecommunications, manages the Creative Physics course which combines traditional satellite distance learning methods with computer-communications networks for interaction among participants.

Teachers who wish to participate in innovative models of educational activity need opportunities to develop new skills and content knowledge and evolve new roles. They need ongoing support — technical, pedagogical, and specific to the domain of inquiry. What kinds of support will they need? Who provides this support? What are some alternative cost-tolerable methods of providing it, and which are most effective? The Alice testbed includes several different approaches to this. The state education agencies of Texas and Nebraska, through their regional education service units, are providing technical training and support. The federally funded curriculum projects are providing subject-matter training. The EPA Wetlands project, through SERC, is providing teacher training via satellite video.

A major cost in all project-based network activities has been the cost of user support for both technical and educational content issues. In many projects, this cost far exceeds the cost of telecommunications and materials. What are these costs? What circumstances influence their importance? Does a common technology reduce these costs? Is it less costly to support experienced teachers? What strategies are available for minimizing these costs? Are there ways for these costs to be spread to volunteers, students, or other participants?

By far the most important questions have to do with the nature of the educational outcomes and benefits of these innovative models, and the contribution of the Alice software tools to achieving these benefits. Some of the benefits we hope to see over several years if the next phase is funded include:

- participation in real inquiry by a much larger and more diverse population of students, teachers, and experts than is currently the case, because some of the technical barriers to participation will be removed
- much more interest in forming and managing communities of inquiry on the part of educators and educational service providers, because of the relative ease of setting up such project-based groups
- greater recognition on the part of school officials and taxpayers of the value added to the community by students and teachers engaged in productive inquiry in areas of social and scientific importance
- a shift toward more interdisciplinary, contextualized learning opportunities for more people, because of the availability of supportive communities and expertise.

Some of the testbed applications offer a rare opportunity for insight, because the teachers have been involved in the same or very similar networked activity without benefit of these tools. For example, approximately 100 teachers participated in Global Lab in 1992-93. For telecommunications, they connected in host-terminal mode to IGC. They transmitted their data tables in comma-delimited lists and interacted in traditional text bulletin-board-type forums. Of the 100 teachers, a spring survey found that 65 percent did not download data from other schools, 83 percent of the U.S. teachers were not able to study and analyze data from other schools, and 43 percent were not satisfied with the telecommunications structure. We predict that next year, when all the teachers have the easy-to-use Alice software tools for data analysis and telecommunications, these percentages will be very different. And this will be important in terms of educational benefit, because students who can't download a data set are not likely to have opportunities to develop skills in data analysis and interpretation!

FrEdMail offers a different opportunity for insight into the effects of the tools on the educational outcomes of a networked project. Many of the teacher-initiated projects on FrEdMail are of the collaborative investigation type that Alice tools are designed to support. We will invite some of these teachers to repeat the activity this year, using the Alice tools interfaced with FrEdMail, and we will observe the changes in the learning, teaching, and inquiry from last year.

The State Systemic Initiatives projects in Texas and Nebraska offer opportunities to learn more about the possible contributions of networking to systemic reform in science and mathematics education. When the leaders of the SSI projects see the Alice model and tools, they immediately begin to think of new ways to involve teachers in new kinds of content and pedagogy. By simplifying the management of on-line community activities and projects, we hope to make it easier for educators to experiment with new ways to involve and support teachers in the reform processes.

By involving a wide range of applications and organizations in the testbed, we intentionally achieve a situation in which users are dissatisfied with the state of the art. Math educators want to include geometric drawings in their databases and communications. Project organizers want tools to help manage on-line projects. Localities want more detail in the map database. Earth science teachers want to be able to integrate NASA satellite data with locally generated data.

By proactively seeking to function in the broadest range of telecommunications and network contexts, the testbed reduces barriers to broad participation and allows the project to assess the differential outcomes and cost-benefits of alternative connectivity models. This is a key to providing the needed policy input.

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Theme Session (F7B)

Learning to Use the Internet: Issues for Instructional Designers and Teachers

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Abstract

Designers and teachers of Internet courses that support constructivist learning and empower learners must be educationally aware as well as technologically conversant. The cooperative computing organization of the Internet, its ever-changing nature, and its technological constraints affect every course network usage and every teacher. Each time a course is given that teaches it is

out of date. Each course must be redesigned each time it is taught. In designing courses about using Internet, there are a vast array of issues with which we must deal. There are issues related to Internet itself (its dynamism and organizational structure), instructional design issues (educational models, content, course format), new technical issues (connectivity requirements, facilities requirements), learner issues (learner style, computing experience), new learner issues (computer literacy and access to facilities), teacher issues (teaching style), and new teacher issues (technical experience and access to facilities). So in addition to the traditional instructional/curricular design issues with which we have always had to deal, we now must deal with technical and personal, learner and teacher issues. We as educators, technologists, instructional designers, and telecommunicators are charged with the responsibility to navigate the Internet ocean and inform others of what paths and landmarks they must seek to reach their chosen destination.

I have found designing and teaching "Learning to Use the Internet" courses difficult and challenging. Over the last four years, as Director of Computer Training and Instructor of Computer Applications in Education, I have taught novice to advanced computer users various aspects of telecommunications. Each and every time I thought I had a well-designed course or unit, I was mistaken. Sometimes students did not see the use for telecommunications or they could not master the software and hardware to use telecommunications or Internet had changed again or the topics covered were not relevant or the students and teachers could not understand each other. Every time, there were different reasons why the course was not successful. I have pondered long and hard over the years why this particular subject matter is so difficult to teach well.

Computing Experience

One issue that seems to affect the learner is computing experience. Those who have been using multiple products for several years seem more able to learn telecommunications products such as electronic mail and the Internet. Those who have only used one type of product, such as word processing, have a much harder time understanding telecommunications topics. Anecdotally, I would surmise that using multiple products requires learning multiple interfaces. The more products learners have used, the more interfaces they have encountered. So learning a telecommunications product such as electronic mail is not as daunting.

To address the experience issue, I always survey the students to determine not only their experience level but also where they work or what program they are pursuing. I then can tailor the examples and answers to be specific to a particular person. For example, if an administrator in a hospital has difficulty understanding how to use ftp, I will create an example based upon accessing patient medical records and billing information from the hospital. Or if a student from the nutritional education department, who has used only a word processor, is having difficulty mastering electronic mail, I will have the student join a listserv on nutrition. I will then show the student how to create the messages using the word processor and send that to the electronic forum. I always try to concretize the information by making it relevant to the student's area of interest and previous experience.

Presenting Concepts

The Internet and telecommunications are still in the infancy of technological development and there are often glitches: the modem does not connect, the user is suddenly disconnected, an arcane error message appears, a command line interface is required, and so on. At the present time, to be a calm telecommunicator requires some understanding of what the components are and how they all work together. Unlike microcomputing, where users start a product, do their work, and exit, using telecommunications means knowing many different products and understanding how they all link together. However, I have found that presenting all this information first can have an adverse affect. Users with limited experience feel overwhelmed by technical-ese and technology. They feel inadequate and give up before they begin. Users with more experience can also feel overwhelmed by all the technology. However, they are more willing to proceed.

One way I deal with this issue is to slip the information in during the exercises. If I am teaching electronic mail, I will have the students immediately start up electronic mail (we use Pine on UNIX) and send mail to me. I will then forward the mail to another student and have the second student send mail to the first. Once I have the students exchanging mail, I will discuss how the mail gets routed and what the components are. I use as little technical language as possible and draw parallels to real live situations. So when discussing routing, I will talk about the telephone system. I will draw the parallel between waiting for the phone to ring and waiting for the electronic mail to be delivered. I will show how each method is an interconnection of many systems to get from point A to point B.

Other conceptual issues I deal with are etiquette and security. Here I stress that no electronic network is really secure, so one should never send on the network what should be private. This is always a bit disturbing to learners. Depending upon the makeup of the class, this sometimes leads to a discussion of how Internet and worldwide networks are organized. The idea of etiquette is easily understood. I remind them that it is easier to write an electronic mail and that these messages may be less formal and have spelling, typing, and other errors in them. People need to remember not to judge the sender based upon the format but to consider the content first. Again, I illustrate this with mail messages from myself, which are always full of typing and spelling errors.

Structuring the Content

I find this one of the more complex issues, as there are so many variables that can affect the content structure. Is the content unit a training course or part of an academic course? Is the content unit structured to be an introduction or to teach actual skills? Who are the learner population and what are their needs? What kind of technology and network access do the learner population have? If the content unit is part of a course, what content should be taught to achieve the goals and objectives of the course? What is the technology available for the content unit? Other basic questions are, What are the goals and objectives of the content unit and What is the assessment vehicle? All of these questions need to be answered during the design process.

Teaching both training and academic courses has provided me insight into some of the issues. Students of the training program are any member of the university community: administrators, faculty, researchers, librarians, graduate and undergraduate students. The learners include not only persons registered at or employed by the university but also members of affiliated educational institutions. Thus we have a large body of students who do not have the same access capabilities as students and employees of the university. The goal of the training program is to provide a basic introduction to particular topics in computing and telecommunications. Students who take the training courses are there to learn the *how-tos* and do not feel the need to learn concepts.

We recently redesigned our electronic mail and Internet tools training courses to make the content more meaningful and useful to the students. For several years in the training program, we have taught introductory and intermediate-level courses on electronic mail and an introduction to telecommunications course. With increases in E-mail and Internet users, we found, based upon the users' questions we were answering and the course evaluations, that the courses did not meet the needs of the users. In the design process, we had to address many of these questions.

The students of the training courses use many different microcomputers and telecommunications access methods. The main university uses SUN UNIX and Pine as the electronic mail platform. However, many of affiliates use Berkeley or AT&T UNIX or VMS on VAXes or IBM VM/CMS systems which support TCP/IP connections. The major types of microcomputers are DOS/Windows-compatible machines, Macintoshes, and Nexts. Users may be connected via serial communications with a standard modem and telephone line, an integrated digital modem on the campus telephone switch, token ring networks connected to TCP/IP gateways, Appletalk LANS connected to the TCP/IP gateways to the campus ethernet backbone or departmental ethernet networks connected to a departmental system which in turn is connected to the university fiber backbone. With this variety of microcomputer platforms, operating systems, and connectivity methods, the first question the design team faced was, What platforms would we use for teaching? Would we teach on DOS/Windows machines or Macintoshes or Nexts? Since DOS/Windows users are the largest group, we decided to use our DOS/Windows teaching lab.

Next the team had to decide what topics would be covered and how the topics would be organized. Using the questions and course evaluations, we decided that the major topics of interest to users were finding what is on Internet, using electronic forums (listservs) and news groups, and transferring files and information on the Internet. Since these content units were for the training program with the goal of teaching skills and since the learner population attends these courses specifically to learn the *how-tos*, three courses covering each content unit were developed along with the existing introduction to electronic mail.

In my graduate course, I teach educators or psychologists the *how-tos* and the *what-are-the-uses*. The goals of this course include: learning to use computing technology effectively to find, manipulate, and present information and learning how to use computing technology products. Most of the graduate students have little or no understanding of how computers and telecommunications really work. Additionally, the present electronic mail system and Internet connectivity are convoluted and arcane at best. Given the technological constraints and the experience level of the learners, my goals for this content unit deemphasize the *how-tos* and stress the *what-are-the-uses*. I cover only the very basics of electronic mail — reading and sending E-mail — and use the university's public access information system as the vehicle for finding resources on the Internet. Several of the assignments require group work. Since the student groups often cannot meet, they are to use E-mail to complete assignments and send E-mail to me with the completed work. The university public access information system is ASCII based, organized hierarchically using menu, and links to many of the Internet Gopher sites. The user enters a menu item number and the "command" is executed. This straightforward interface and connectivity to other sites on Internet allows assignments that require the students to demonstrate they have learned how to work their way through the system. Once they have found what I have asked of them, they must send me E-mail indicating that they found the result and summarizing what they did to find it.

So whether the content unit is part of a training course or part of an academic course, the teachers and designer must consider the content structure within the larger context of technology, learner, and teacher. I know for a fact that I will need to redesign this entire content unit in the graduate course for the spring semester, for the telecommunications technology platform will change as of January 1.

Changing Technology

Connectivity changes take many forms. The technology itself can change, as in the release of new versions of software or new microcomputers or changes in the connectivity technology and standards. Within the Internet itself, resources may move from one site to another or access methods may change or new interfaces such as World Wide Web or WAIS may be implemented. Your own local site may change, moving from serial communications to network communications or changing operating systems from VMS to UNIX.

Recently, we upgraded our DOS/Windows teaching laboratory to high-end 486 machines with ethernet connection. As part of this upgrade, we changed the way Telnet is used. Instead of executing the Telnet program to link to another system. We now invoke Telnet under Kermit 3.13. Many of the students taking our training courses will not use Telnet in this fashion. So we will need to make clear to the students that this method of linking may be different from the one they use in their office. We also need to be prepared to provide the students with information on how to upgrade to this manner of linking.

Two of the Internet Tools content units cover Archie and ftp. Students will access Archie and certain ftp sites, search them, and then download files. So we will need to check that the Archie and ftp sites are available during the hours we need them. Therefore, we developed a list of possible sites for exercises. This increases the preparation time for each class. Additionally, teachers must be sufficiently Internet-conversant to adjust the exercises at the last minute if necessary.

Then there are the situations in which one Internet site uses one version of a program and another site uses another version of the same program. Recently, a researcher at our university was using an interactive talk program which he had learned in one of our classes. He then attempted unsuccessfully to use the program to talk with a colleague at another university. We determined that the two host sites were using different versions of the same program. A point we had not covered in the course was version compatibility of the software we designers had not considered it in relation to Internet functioning.

The Internet and other worldwide networks are evolving and changing so rapidly that designers and teachers of Internet-content units must constantly be aware of these changes. Teachers must use the Internet regularly to be able keep their courses current and meaningful. The time spent navigating and investigating network services is a mandatory part of preparation to constantly update and verify the course design and content.

Teachers' Issues

Keeping current with the dynamics of the Internet requires teachers and designers to have the technology and time to use the network in addition to whatever else they do. They may be college professors or K-12 teachers or computer/communications technologists.

If the teachers and designers are computer/communications technologists, then concepts such as learning styles, teaching styles, and instructional models are very likely unknown. Just as the jargon of computing is a foreign language to the general population, so the jargon of education is a foreign language to technologists. To ask a technologist to design a course using the constructivist model with multimodel exercises for kinesthetic, auditory, and visual learners is akin to asking an educator to design a program to analyze traffic information available from the SNMP network manager. Not only do few technologists have an education background, they are most likely to choose the lecture format as their preferred style of teaching. Their educational experience to date has been with the traditional lecture format, the Banking Concept of Education (Feire, 198?). Also, when they do consulting, they are the authorities dispensing knowledge. So when they enter the classroom, they teach based upon this experiential model.

For educators who are designing and teaching an Internet-content unit, the probability is that the unit is part of an academic course. The content issues discussed above as well as the instructor's own teaching styles and understanding of learning styles must be considered. If they generally use the lecture mode of teaching, will this unit be taught in the same manner or in a hands-on computer classroom? What is the extent of their own technical knowledge to be able to answer students' questions? How will they deal with students who have more Internet experience and knowledge than they themselves do?

What arrangements are made for students who have problems with out-of-class assignments to get their questions answered? Will the educator answer all these questions or have arrangements been made with some computer support group in the school?

Whether the teacher/designers are technologists or educators, their role in the educational process is changing. As educational theorists such as Seymour Papert, Jerome Bruner, and Robert Taylor have written, computing and instructional technologies shift the role of the teacher from *giver-of-information* to *facilitator*. The issue is then how to address this role shift and the different perspectives and experiences of educators and technologists. One method is to use cooperative design and teaching. Have educators and technologists work together as a team from the inception of the design through the actual teaching and assessment. This not always easy or even practical, but it is effective.

I have used this technique successfully in designing all our computer training courses. I am the only educator on the teams. Overcoming the language barrier was the first hurdle. Since I am both technologist and educator, I took the initiative. I often felt like a serial modem; modulating and demodulating between technical-ese and educational-ese. Again, using the student course evaluations, we agreed upon a hands-on approach for all the courses, particularly the E-mail and Internet courses. With this decided, the shift from lecturer to facilitator was a natural outcome of the format of the course. Through design of the exercises, a constructivist model was incorporated. As these are training courses with limited time, a certain amount of lecture was found to be necessary. The technologists/teachers felt comfortable with this format, since it correlated with their educational and consulting experiences.

Teacher Recognition

Designing and teaching academic courses involves other issues also. The relationship between technologists and educators can be fraught with problems other than language. In higher education, technologists are often classed as administrators and faculty view them as unfriendly. This structure can create an adversarial relationship, which makes cooperative design and teaching difficult. In many colleges and universities, academic computing areas are reaching out to the faculty to work more cooperatively. However, most academic computing areas are short on staff. So for both faculty and technologists, working on Internet courses is yet another task to be done. For faculty, the recognition issue of scholarly value for integrating technology or writing courseware is of much concern. Junior faculty seeking tenure often cannot expend the time and effort on such endeavors, since it will not be considered in their tenure review. Tenured faculty must want to make a commitment to such an endeavor.

In K-12, often the *computer support person* is not a full-time staff member but an interested teacher who does this in conjunction with other teaching duties. While working with other faculty is already a part of the computer coordinator function, becoming heavily involved with designing and teaching an Internet content unit is yet another task to be added to the existing load. However, teachers who are committed to addressing such issues as problem solving, critical thinking, preparing students for living and learning-how-to-learn take the initiative to learn and use the Internet. The number of K-12 faculty I see on the various electronic forums on the Internet about education and the network/computing grows daily But recognition for such efforts from school management, parents, and school board is not always forthcoming.

Practical Issues

The list of practical issues is long and extensive. Those of us who have taught in computer labs have experienced "it doesn't work — what do I do now." Teaching network courses adds yet another layer of technology that can go wrong. The local network is not working, the connections to the Internet are not working, connections to a particular site are not working, the computer projection is lousy, and on and on and on. There are also the issues that must be addressed during the design process. Where will the course be taught? Is the course to be hands-on? Is the course a distance learning course using the Internet itself? What is the class size limitation, if any? What types of machines will be available for hands-on courses? Will there be homework assignments, and if so where will the students do the assignments? Do the students need to have special access privileges to do the assignments? The answers to each of these questions and many others are unique to the particular teaching/learning environment.

For the training classes, I never give out-of-class assignments. All the assignments are done during the classes, for they are an integral part of the course design to achieve the course objectives. For the graduate class, I do give homework. These assignments are also designed to move the learning process along. The graduate students either use the computing labs in the university or dial in from their home to the main computer. I make sure that the software for both the training courses and the graduate course is whatever is generally available in the labs and on the central systems. Therefore, the student can have questions answered by the academic computing consultants.

Organizational and Political Issues

The organizational and political/legal structure can affect access to various Internet resources and services. In the United States, the Internet is organized in a three -layer distributed structure that is managed cooperatively. The backbone is NSFnet, and the National Science Foundation (NSF) provides overall direction, policy guidance, and federal funding for the backbone layer. The regional and state levels vary. Generally educational, research, and commercial organizations work together through a governing board or organization to provide the access to the backbone and work with the backbone organization. Funding, policy, and technological requirements are set at the regional level by the regional group. The local level is made up of the individual organizations which are linked to the regional level. All the levels work together between the layers as well as within a particular layer. It is a cooperative computing environment without central control but with agreed-upon standards. The members of the community decide among themselves what the Internet resources will be and how they will be accessed. Service and support are the responsibility of a sponsoring member.

This cooperative organization has created a dynamic environment that promotes new development and uses of Internet. However, the contributors to Internet are a mix of commercial, educational, governmental, and nonprofit institutions. This mix has raised some legal and policy issues. The backbone and regional networks are funded in part from governmental funds. Commercial use of publicly funded facilities is contrary to the intent of the laws. Therefore, the creation of a parallel network for use by the commercial users of Internet is being seriously considered. What the effect of such a division will be is not clear. Will commercial users still be able to access Internet resources? Will noncommercial users be able to access commercially supported resources and if so, will there now be exchange of money required? How will this affect the dynamism of Internet? These are only a few of the questions to be formed, asked, and answered.

The distinction between commercial and non-commercial institutions and subsequent restrictions and limitations is defined by laws. This is a time when national television news casts report the functional illiteracy rate of the United States to be as high as 47 percent (NBC, 1993) and businesses state that they have to reeducate the graduates entering the work force. There is a need for cooperation between business and education to rethink the educational system. The arbitrary distinction between business and education is blurring by necessity. Internet and computing have been major contributors to the dissolution of this distinction. However, our laws still mandate such a distinction, and this can affect the evolution of the Internet. This distinction also affects the provision of information, which is an essential element of education. As networks are used educationally, we, as designers and teachers, must constantly be aware of the changes on the Internet.

Technology Haves and Have-nots

The cooperative structure of the Internet in the United States has also led to a role reversal. Until the last five to seven years, business was the leader in technological development. Education has been playing catch-up. But, with the successful implementation of NSFnet and the implementation of the present Internet organization structure, research universities have become the research and development arena for telecommunications, instructional technologies, multimedia, and a host of other computing developments.

In 1992, there were 400,000 computers and 3 million users worldwide on Internet. In the United States in the same year, there were some 3,000-plus accredited institutions of higher education, with over 14 million students enrolled and 104 graduate and research universities, constituting 90 percent of such institutions, and enrolling some 2.2 million students (Roberts, 1992). These 104 graduate and research universities and those institutions of higher education who can afford it have made commitments to telecommunications and technology. They are the technologically committed members of Internet, providing and supporting Internet resources. The institutions of higher education that cannot afford to make major commitments to technology/telecommunications development are the users. They are dependent upon communications facilities of the communications common carriers. In some geographical areas, advanced transmission systems such as fiber optics are available. Here, there is the possibility for transmission of graphics. In other areas, the transmissions systems or the old copper cable limit telecommunications capabilities. Some institutions can afford investments in hardware, software, and support personnel to allow access to the newer developments such as WAIS or World Wide Web, while other institutions cannot afford such an investment and are limited to ASCII terminal emulation using central time-sharing machines.

In the K-12 arena, particularly in public schools, this is even more true. Few can afford the basic telephone line costs, and few have central time-sharing systems they can link to Internet, let alone the technologically knowledgeable personnel to support such endeavors. Those K-12 schools which are linked to Internet have done so through grants and the support of higher educational institutions. Politically it is difficult for public K-12 school to justify such an investment when they are being criticized for graduating functional illiterates.

The increasing disparity between the technological commitment and the technological users is bringing to fruition the claims from the early 1980s that there would be computing haves and the computing have nots. Such a division arises from the economic and political situations within the school systems. There are now haves and have-nots in the realm of information. Those who can access the worldwide communications networks are the information haves, and those who cannot are the information have-nots.

We educators and technologists must address this issue. In the Internet courses we design we must match content to learners' environment. To teach about ftping, Telneting, and transferring files is nonsensical if learners do not have the technology available. Yet we must also make learners aware of what is available and help them gain access to the worldwide information facilities.

Conclusion

We as educators, technologists, and telecommunicators must address many issues both in and outside the teaching environment. Designing and teaching Internet courses, whether in a classroom environment or on the network, requires that we still address the issues of instructional design: content, learner styles, teaching styles, course format, learning activities, educational models. But we must also understand the technological environments within which we "teach" and within which learners will learn and work. Our role has expanded well beyond the *traditional teaching role* to one of guide and facilitator, political activist and technological developer, information user and information creator. I have addressed only some of the issues that we all face. Talk to any teacher/designer of an Internet course and you will find that he or she has yet another set of issues.

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Theme Session (F7C)

SCHLnet News Service: Linking Teachers and Students around the World

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The Global Schoolnet (formerly FrEdMail) Foundation is announcing SCHLnet, a new networking service addressed to teachers and their students. If you are a teacher you may wish to bring this information to the attention of your network administrator.

What is SCHLnet?

SCHLnet is a new distributed conferencing management service that meets the needs of K-12 educators and their students on the Internet. Because it is a distributed conference, it effectively puts teachers in touch with one another throughout the United States, Canada, Europe, Latin America, Australia, the Orient, Russia, and many other countries, even where direct Internet access is not available.

SCHLnet solves the problems of "noise control" on Internet. It moves your listserv and group mail topics out of your personal mailboxes into the SCHLnet conference area, organized by topic, and ready for browsing when you are ready. Your mailbox will once again be used only for personal correspondence.

SCHLnet uses USENET format newsgroups to create a "mini-usenet" aimed specifically at K-12 teachers and their students. SCHLnet creates an interactive flea market of ideas, resources, opportunities, and information that is of specific relevance to teachers and their students, without the extraneous and sometimes offensive distractions (from the perspective of K-12 educators, children, parents, and local school boards) posed by USENET netnews.

How Does it Work?

SCHLnet news is delivered directly to your local network using the USENET message interchange format, and available via Internet, UUCP, Global Schoolnet Foundation, and other delivery protocols. Network types include school BBS, district BBS, school LANs, districtwide area networks, and regional or statewide networks. (Individuals may also subscribe to the CALLS hierarchy directly; see below).

The USENET delivery protocols are supported by a variety of packages for Unix and other systems. If you're already on USENET, you're ready to receive SCHLnet with no extra effort. If you're not on USENET, many public domain newsreading programs are available, usually at not cost.

SCHLnet is a service of the Global Schoolnet Foundation, a pioneer and leader in networking services for educators for the past decade. The Global Schoolnet Foundation monitors all newsgroups and actively moderates many of them. This service ensures that your teachers and students will find a professional networking venue appropriate to your local community standards.

What content is available on SCHLnet?

SCHLnet newsgroups are discussion and information forums for various topics of interest to educators. These newsgroups are delivered to schools and networks around the world, thereby creating an international distributed conferencing system.

Current subject categories include a range of topics. New topics will be added as demand dictates. Current categories include:

CALLS – Calls for collaboration, collaborative project announcements, requests for project partners and sister schools, and keypal requests. (This is our "special" newsgroup and is discussed below.)

NEWS - News and information on a variety of topics, including America 2000 Daily Report Card, CNN Newsroom Daily Lesson Plans, and other publications and announcements to educators.

SIG - Special Interest Groups and discussion forums on a variety of general-interest issues.

CURR - Curriculum Interest Groups, similar to SIGS but specific to curricular themes.

PROJ - Current and Recent Classroom Projects. Ongoing network-wide projects will be conducted in this area, so that all participants may "peek" at the progress of a project and new participants may choose to join.

PUB - Publications of various sorts, INCLUDING the electronic publishing of the best of student work. Teachers supervise the selection and posting of only the BEST of student work. Other electronic publications from around the Internet will also be posted here.

STU - Various student topics/exchanges. This is the place for students to correspond with one another. Moderators encourage appropriate and timely discussions on a variety of topics.

What is the CALLS newsgroup?

A particular area of focus is the newsgroup hierarchy "CALLS," which is dedicated to "CALLS for collaboration." Here teachers themselves post their own announcements for project-based learning activities.

CALLS meets the needs of busy teachers who are looking for relevant learning projects for their students and who want a reliable forum for soliciting collaborators for their own projects:

- Novice teachers coming on-line need a rich collection of varied, simple, and useful curriculum-focused activities, gathered in one place for easy access.
- Teachers need examples of successful project planning, implementation, and evaluation if they are to take the initiative to organize and implement their own project ideas.
- Teachers and budding project coordinators need help in project development. Many excellent project ideas languish for lack of skill in "bringing them to market." Teachers need help in refining their ideas, developing a marketable project announcement, and obtaining collaborators from the widest possible pool of potential participants.
- Busy networks need some form of "noise control." Announcements for exemplary projects must often contend with an ocean of messages asking for penpals, sister schools, and messages of the "Kilroy was here" genre. Most teachers don't have the time to wade through a large volume of extraneous mail looking for "gems." SCHLnet CALLS topics will contain only project-based collaborative learning activities.
- CALLS projects learning experiences will engage students in collaboration with other classes in their. Students will measure, collect, evaluate, write, read, publish,

simulate, hypothesize, compare, debate, examine, investigate, report, and summarize their learning experiences. Much of this will take place via the network as they collect, organize, share, and report.

What does the Global Schoolnet Foundation do with CALLS?

As the primary moderator of CALLS, the Global Schoolnet Foundation will:

- publish a calendar and curriculum matrix for projects appearing on CALLS each semester or each quarter
- screen and post project ideas which meet the established project criteria
- work with teachers who have worthy project ideas to develop credible project announcements for posting on CALLS.

How can teachers use CALLS?

- Read CALL to find credible, worthwhile classroom-based, collaborative learning activities. Since it is moderated, only well-organized and useful projects will be announced here. You will not have to wade through oceans of trivia to find good projects.
- Post your project on CALL to solicit participation from the widest and most interesting audience possible. The Global Schoolnet Foundation will post your project announcement on the appropriate CALL newsgroup. If your idea is missing some elements that are crucial to its success, we will work with you to develop a well-structured call for collaboration which will assist in developing a successful project.

What does it cost? And Why? USENET is free!

Yes, USENET is free to the user. It is also completely unmoderated. Therefore, many topics are not appropriate to the K-12 environment. SCHLnet newsfeeds, on the other hand, deliver monitored, professional forums for K-12 educators and students which meet the standards of your local community.

SCHLnet fees cover the costs of managing this service. Fees are moderate and in keeping with the philosophy of the Global Schoolnet Foundation, a nonprofit corporation which for eight years has provided free and low-cost telecommunications to thousands of classrooms.

Fees for SCHLnet newsfeeds and services are based on the size of your network and the number of educators and adult users with access to SCHLnet. Network types include school BBS, district BBS, school LANs, district wide area networks, and regional or statewide networks. Contact fred@acme.fred.org for current fees.

How do I subscribe?

If you are a network administrator, request an electronic order form and the full sheet of terms, conditions, and fees from fred@acme.fred.org.

You can also write to us at Global Schoolnet Foundation, P.O. Box 243, Bonita, CA 91908-0243 or call (619)475-4852.

What if my site can't join, but users want to subscribe?

If your sysadmin is not willing to put the "schl.net" newsgroups on your network, we will be glad to send you selected SCHLnet newsgroups via your normal Internet E-mail address and bill you individually. You will probably want to receive all of the CALL newsgroups, plus selected other newsgroups that especially pertain to your needs.

How do I get a news feed?

If you already have an Internet address, then we can send the newsfeeds to your network. If you don't, you can get UUCP feeds directly from UUNET or PSI. Write to postmaster@uunet.uu.net for details on how to become a customer. This organization provides cheap communications, but does charge a $35/month administrative fee on top of the telecom charges. After that, it can feed you anywhere in the USA for as little as $5/hour. PSI charges a flat fee of $75/month for leaf-site access to E-mail and news, with local access in selected areas. Mail info@psi.com or phone 800-82psi82.

You can also get a feed from one of our existing customers in your area. Our net is growing. Contact us to see if we have a feed site in an area that you can call.

If there is no feed point suitable for you, we will keep you on file and inform you when one shows up.

Can I see what it looks like?

We'll be glad to give you a free one-month trial of SCHLnet with no obligation. If you already connect to UUNET or the Internet and you can receive USENET newsfeeds we can set a trial up for you almost immediately, with no effort on your part.

If you're not satisfied with the products at the end of the trial, send back the invoice (even by E-mail) and you will be charged nothing.

What about feeding other sites?

USENET works by having one site in an area feed other sites. SCHLnet can work that way too. If you apply for permission, and you have the capacity to do it reliably, we will let you feed other sites. In fact, we'll pay you to do this by reducing your subscription fees by

10 percent of the fees that we charge the sites you feed directly. You can either register with us to feed sites, or you can go out and find possible subscribers among the sites you already know. If you do that, we'll discount your price even further.

Feed 7-10 similar-sized sites in this manner, and your subscription will be free.

What are the terms and conditions?

SCHLnet products are offered under special terms. If you wish to subscribe, we'll send you the full sheet of terms and conditions. In general, the terms state:

- You must not interfere with the operation of the SCHLnet network (no forged control messages, etc.).
- You must respect copyright, and not allow unauthorized access.
- SCHLnet's audience includes young children. Consequently, we prohibit profane, discourteous, abusive, racist, sexist, obscene, and sexually explicit language. You must assist the Global Schoolnet Foundation in enforcing these standards among your users.
- You must pay your subscription fees on time.
- Customers may not resell or republish SCHLnet news feeds, (Some limited use on fee-paying BBSs is allowed.)
- Articles must be kept intact.
- SCHLnet is not responsible for information provided by outside information providers. Most newsfeeds are offered on an as-is basis.
- Customers are responsible for the cost of communication from a SCHLnet feedpoint to their computer.

What if I don't have a Unix system?

Software packages are available that handle USENET format news for many different operating systems. There are even a couple of free/shareware packages for the IBM-PC. One that we recommend is called Waffle and can be downloaded as shareware from Compuserve and other information services.

The simplest and least expensive approach to receiving and distributing SCHLnet to your teachers is through the Global Schoolnet Network, which uses readily available Apple IIe and IIgs computers. We can send you additional information about the Global Schoolnet Network.

Theme Session (F8A)

European Activity and Trends with Telecommunications in Education

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Abstract

Telecommunications in Europe is a dynamic subject, involving many different persons, organizations, and projects. An overview is given of some of this activity through descriptions of the DELTA Project (a major initiative sponsored by the Commission of the European Communities to stimulate flexible and open learning with telecommunications) and highlights of the contents of two major European conferences on telecommunications in education. Contact addresses and major sources of information are provided.

Europe: Major Activities

Europe, in particular the twelve countries of the Commission of the European Communities, the Scandinavian countries, and Switzerland, has many different layers of activity with respect to telecommunications in education. Three in particular form a good example of the range and types of activity going on. These are the DELTA Project, as an example of a large initiative sponsored by the commission, focusing on research and development for flexible and distance education and training; the Conference on the Use of Databases and Telecommunications in Education, which was held in Denmark in June 1993, featuring official reports from 12 countries as to their policy and practice with telecommunications in schools; and the Teleteaching Conference, held in August 1993 in Norway, in which approximately 200 persons from 32 countries, including 17 from Europe, presented reports of their activities with telecommunications in all phases of education and training. These three can be used as a good basis for an overview of the state of the art in telecommunications use in education in Europe and as a basis to identify trends and major types of initiatives. Some of these trends and initiatives are similar to those occurring in other parts of the world, particularly North America and Australia, but some are different.

DELTA

In Europe, considerable effort and emphasis is being devoted to the potential contribution of telecommunications to the strengthening of the levels of skill and technical expertise of its citizens, the reduction of the so-called training gap which is seen as a serious problem for the present and the future. There is seen to be "a serious skill shortage problem in Europe as well as in the United States, Canada, and Japan... across a whole range of occupations covering intermediate and high level skills." This, "combined with a decreasing workforce, is increasing the need for re-training and updating" (Van den Brande, 1993, p. 75). This problem is seen as being especially severe for the millions of Europeans who for various reasons — being homebound, being handicapped, or wishing to re-enter the work force after a long period of absence from it — are cut off from traditional educational facilities. Thus, pushed by a focus on training, retraining, and ongoing professional development, and in the context of a strong social drive for equity of opportunity, many initiatives in Europe are focusing on the implementation of telecommunications-based learning, to "enable learners to access learning whenever and wherever needed." There is a particular focus on adults, rather than on schools and children.

The DELTA Project is perhaps the major project of its sort in the world — a large-scale initiative supported by the Commission of the European Communities (CEC) to stimulate cooperative activity across Europe through 27 projects with the common goals of "improving the access and performance of learning services in Europe based on the optimal use of information technologies and telecommunications" and "improving market competitiveness in the training industry" (Roselló, 1993, p. 24). There is a particular emphasis on providing remote access throughout Europe to learning resources; on providing optimum support to learners, trainers, producers of learning materials, and providers of learning services; and on the development of a strong market for telecommunications-available educational resources in Europe. The current phase of the DELTA Project (there have been earlier ones) extends from 1991 to 1994 and has a budget of more than $100 million from the CEC and about as much from European industry, telecommunications providers, and universities.

Participating in this phase of DELTA are 174 organizations from the twelve CEC countries, Switzerland, Norway, Sweden, and Finland. (The twelve CEC countries are Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Spain, and the UK.) The 174 organizations are universities, telecommunications companies, industry, and "small and medium enterprises," relatively small companies that are in the business of the development of learning materials and the delivery of training. Many hundreds of people are involved, and the strong relationships being formed among universities and business are an important side-benefit of the project.

The 27 projects (which together involve approximately 300 subprojects) include:

- The TRIBUNE Project, which is designed to create relevant information flows about issues related to DELTA, and more broadly, to telecommunications-related applications to education and training in Europe

- The OSCAR Project, to develop tools to be used throughout Europe for the collaborative and distributed authoring of multimedia courseware

- The SMISLE Project, to develop multimedia simulation systems for use in education and training

- The ILDIC Project, to develop CD-ROM-based interactive hypermedia and multimedia resources for education and training

- The JANUS Project, bringing together universities from throughout Europe in new partnerships for telecommunications for distance and flexible learning, leading eventually to a "European Electronic Open University"

- The MATHESIS Project, which is building a common "stand-alone workbench" for learners and teachers throughout Europe, through which they will have convenient access to telecommunication services beginning with E-mail and access to distant multimedia learning resources

- The ECOLE Project, focusing on cooperative learning and groupwork at a distance, using telecommunications, particularly for training

- The JITOL Project, focusing on supporting "just-in-time" learning and computer conferencing among professionals throughout Europe, through the combination of specially designed computer conferencing environments and access, through those same conferencing environments, to on-line sources of multimedia learning and reference material

- The SMILE Project, setting up study centers throughout Europe for employees of small and medium-sized businesses to obtain high-quality retraining, and where telecommunications is used to share resources and expertise and to help learners find what is available and where, to meet their job-required needs

Many reports are being written about the DELTA Project and all its activities. Major sources are the DELTA 1993 Annual Report (CEC, 1993), the book "Flexible and Distance Learning" (Van den Brande, 1993), and a set of case studies recently published by the TRIBUNE Project (TRIBUNE Consortium, 1993). Mailing addresses for all of these organizations are given with the references at the end of the article. Plans are well under way for the next phase of DELTA, 1995 to 1999.

The major benefits of the DELTA Project have been to provide coordinated funding and support to university researchers involved in telecommunications in education, to companies developing learning resources and services that can be made available via telecommunications, and to the telecommunications companies themselves to encourage them toward a coordinated infrastructure and a cooperative approach for providing integrated telecommunications services to schools, communities, workplaces, training centers, and even homes throughout Europe. The opportunity for researchers from faculties of education to be funded to participate in such initiatives has brought telecommunications in education to a high level of interest. The strong involvement of industrial partners is a particular benefit of DELTA, bringing educators and educational researchers into partnerships with business and training on a level that probably does not occur anywhere else in the world.

For those we want ongoing information about European activities involving telecommunications in education and training, such as the DELTA Project, there is a newsletter now available, *Using Telematics in Education and Training*, which is published ten times a year. (For subscription information, contact Mr. P. J. Bates, PJB Associates, 10 Green Acres, Stevenage, Herts, SG2 8ND, England.)

Conference on Databases and Telecommunications in Schools

While the DELTA Project focuses primarily on developing the research and learning-materials side of educational telecommunications in Europe, many other initiatives are occurring that are focused directly on the uses of telecommunications in schools. Most of the countries in Europe have some kind of national plan and service to support telecommunications in education. The Commission of the European Communities sponsored a special conference in June 1993 in Denmark to bring together persons in key positions in sixteen European countries to discuss telecommunications policy and activities in schools, and the final report of that conference is available (Smedegaard, 1993). That document contains detailed information about telecommunications support and practice for schools in Belgium, Denmark, Finland, Germany, Greece, The Netherlands, Iceland, Italy, Portugal, Spain, Sweden, and the United Kingdom.

To illustrate the information in this conference report, and the sorts of activities going on with telecommunications in schools in Europe, the report by San José (1993) on projects and support for telecommunications in Spain is a good example. San José describes first of all the services of the PNTIC Headquarters, supported by the Ministry of Education in Spain as support for schools in the use of information and communication technology. Among these services are various BBSs for teachers and students, E-mail services, and a videotex service with on-line databases, tutorials, and information for teachers.

The PNTIC also runs a project called the Mentor Project, in which eighteen small, remote areas in Spain have had a classroom set up by the ministry with a full range of telecommunications and technological resources (computers, modem, TV receivers, fax, telephone lines, furniture, etc.) and in which a particular focus is bringing in adults and students from the local areas, after school hours, for extra education and training opportunities.

Another Spanish project is the Platea Plan, focused on the "launch and support of everything to do with telecommunications in schools." Through this project, 109 teacher centers have been set up throughout Spain, to serve as a node for local online activities, including E-mail, sending files, computer conferences, cooperative work among students, and so on. All the local nodes are in turn connected to the central node at PNTIC in Madrid. Available through the central node are many different educational databases, including one with over 6,000 files of examples of educational activities involving telecommunications carried out in Spanish schools in the last five years, and databases about all the videotapes and software available to teachers through the PNTIC Headquarters; the central E-mail service, now being used regularly at over 2,000 school addresses in Spain; teacher training courses being offered at a distance; and extensive information services. Each school associated with the Platea Plan can send a teacher to a training course, and local help is always available to teachers at the 109 regional teacher centers.

Teleteaching '93

As a final example of the sorts of activities going on with telecommunications in education in Europe, the Teleteaching '93 Conference, held in Trondheim, Norway, in August 1993, included a wide range of presentations by educators and trainers from throughout Europe. The 102 papers which are included in the proceedings (Davies & Samways, 1993) show the range of what is going on, from policy and strategic planning sessions at the Commission of the European Communities to local initiatives involving small children in schools. Among the papers in this collection are overviews of existing and future technologies for teleteaching (Roselló, 1993); a report on a British elementary school's participation in an E-mail project about life on an imaginary planet (Clifford & Warren, 1993); a report on a project going on at the Royal Danish School of Educational Studies since 1987 exploring different ways to support and enrich the 50 Danish schools connected in the Project Network in collaborative projects; the use of video-telephones for distance education for the deaf in Norway (Coppock, 1993); and a summary of the current activities of the European Schools Project, going on since 1987 and now involving 200 secondary schools and other educational institutions in 20 countries, and including curriculum-referenced "teletrips," face-to-face teachers' meetings, and ongoing electronic support for teachers as they plan for, participate in, and reflect on the teletrips experiences (Sligte & Meijer, 1993).

Summary

In one short paper it is not possible to summarize the wealth of activity going on in Europe with telecommunications in education. Some aspects are similar to North America, particularly when comparing national support infrastructures for telecommunications in schools sponsored by Ministries of Education in a number of European countries with those in some of the U.S. states and Canadian provinces, and when comparing the enthusiasm of those teachers and students who get involved in telecommunications projects. However, the cross-border initiatives involving researchers, industry, and policymakers are better established in Europe than perhaps anywhere else in the world.

Also, there is a much stronger focus on telecommunications for lifelong learning of adults, "just-in-time" and in open and flexible ways, than there is in most other regions of the world. Conversely, there is still less grass-roots use of telecommunications in schools and homes than occurs in countries such as Australia, Canada, and the U.S., in that affordable access to large-scale networks is still difficult and varies considerably from country to country. There is perhaps more evidence of projects focused on the design and development of software and learning materials for telecommunications use in Europe than in other regions of the world, partly because of high-level financial support and of the value given to such research in faculties of education (see De Vries & Collis, 1993, for an example of how the national telephone utility in The Netherlands has funded the design, development, evaluation, distribution, and redevelopment of data communication software for schools, simulation software to help students and teachers get familiar with on-line work before going on-line, and many other projects). There is also probably more systematic use of telecommunications for multiple-language experiences than in other regions of the world (see, for example, Rasmussen, 1993).

Thus, Europe has much to offer in the way of experiences and insights and partnerships with respect to the use of telecommunications in education and training.

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Theme Session (F8B)

American Teachers' Use of Telecommunications

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Keywords: telecommunications and teaching, professional development, student learning

American Teachers' Use of Telecommunications: Findings from a National Survey

The remarks I will make today are based on a nationwide survey of 550 elementary, middle, and high school educators who are active users of telecommunications technology. In this study, which was carried out in the spring of 1992, we were interested in finding out how American educators are using telecommunications services for two principle purposes: professional development and student learning.

The findings suggest that for this group of educators telecommunications serves as a valuable resource for both professional and student learning activities. The findings also suggest that these educators represent a very specialized group. They are experienced and highly educated teachers. They are extremely knowledgeable about computer technology and have been using a range of computer-based applications in their classrooms for a number of years. And, they are working in schools that are well endowed with computer resources. They are the individuals who have been pioneering telecommunications activities in our nation's schools.

Among this group it is the technologically knowledgeable computer and library media specialists who are taking the lead for telecommunications activities, serving as resource people and facilitators for colleagues in their schools. Our data also suggest that there is not widespread administrative support for telecommunications activities on either the district or the school level. Although the schools and districts represented in this study have invested in training teachers in general computer-based applications, training in telecommunications is almost nonexistent. The majority of our respondents are self-taught, and they tend to gather information about telecommunications activities by attending conferences or workshops on their own time.

While their personal motivation for using telecommunications is extremely high, the findings also suggest that there are pragmatic incentives that encourage the use of telecommunications for both professional and student learning tasks. Combating isolation, exchanging ideas, and obtaining information are all important factors that motivate the use of telecommunications for professional purposes. Expanding students' awareness, accessing information resources, and increasing students' higher-order thinking skills are the factors that make telecommunications a particularly compelling resource to use with students.

While the overall findings of this study speak to the largely beneficial and rewarding aspects of using telecommunications technology, this research also raises an important question. How can this technology be made available to educators who are less technologically sophisticated and perhaps less personally motivated to become technological enthusiasts than the individuals represented in this study? The results suggest that if the use of telecommunications technology is to become as widely based a practice as are general computer-based applications, certain supports must be put in place.

- Schools and districts must get involved in training teachers in the use of telecommunications. At a minimum, the same level of investment that schools and districts have made in computer-based training needs to be present for training teachers in the use of telecommunications.

- Schools and districts must develop and adopt plans for the use of telecommunications in instruction and administration, and such plans need to take into account the ways in which telecommunications can be used to support administrative reforms.
- Respondents' ratings of barriers make it clear that more time needs to be available in the school schedule if teachers are to integrate telecommunications into their ongoing classroom activities effectively. Research on technology integration efforts shows that the typical forty-minute class periods are not adequate to projects that successfully integrate computer or multimedia technology into the curriculum.
- In order for teachers to feel confident that student-based telecommunications projects are academically justified, assessment measures must be devised that can adequately capture and account for the kinds of critical thinking and inquiry-based analytical skills that such activities appear to foster.
- There needs to be more financial support available in schools for telecommunications projects (e.g., network fees, telephone lines, support personnel, curriculum development). Because schools are overextended financially, this support needs to come from other sources, including private corporations, foundations, as well as state and federal funding sources.
- Phone lines need to become much more widely available in schools. Teachers are the only group of professionals who do not have regular access to telephones, often because the cost of installing phone lines in school buildings is prohibitive. Ideally, regional phone companies need to develop pricing structures that encourage schools to invest in this technology for their teachers. Alternatively, schools can also consider installing local area networks — a solution that reduces the need for multiple phone lines in school buildings.

Highlight Session (F21)

Realities of Telelearning: A Case for Netiquette

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Keywords: teledynamics, telelearning, communication, training, netiquette obstacles, text

Abstract

Teledynamics in the context of distance education is the theoretical model for this paper. The effects of human dynamics on any telelearning environment determines the quality of that environment. This paper isolates major negative influences on the telelearning environment, with particular reference to electronic writing, which result in failed expectations and a false reality, thus restricting the optimum potential of the environment. On the basis of this understanding a case is made for "netiquette" and greater training for those using distance technologies in education.

Introduction

You are no doubt familiar with the popular simulation "Dungeons and Dragons," a simulation which explores aspects of the real world through dungeons (groups of rooms and corridors) in which monsters and treasures can be found. There are many kinds of monsters, but there are some dragons which are the biggest and most dangerous.

This makes an excellent scenario for highlighting the dilemmas of a telelearning environment which result from failed expectations and unrealistic parameters. The dungeons are in effect the telelearning environments, while the dragons are the human dynamics which influence those environments. Like "Dungeons and Dragons," many people working in a telelearning environment are caught in a world of fantasy and are often unaware at the outset of the important influences which shape the real environment. This dichotomy between the real and the fantastic is the fabric on which this paper is woven.

A telelearning environment in the context of distance education is one where people are linked via one or more electronic media for the purpose of sharing ideas and knowledge on a specific topic or topics to achieve a certain end.

Since 1983, the Computer Pals across the World Project (Beazley and Erwin, 1988; Beazley, 1989) has provided an umbrella for a variety of international and national telelearning experiences. Thus it provides an appropriate model for revealing problems encountered, positive outcomes, and future directions for teachers, students, and others working in a telelearning environment. On this assumption a questionnaire was sent to a random sample of two hundred teachers involved in the project to ascertain the most common problems experienced and to elicit suggestions for shaping the project's future. Based on the collective answers from the 162 teachers who responded, ten "dragons" have been identified and isolated to show how they can influence the telelearning environment.

The A Dragon

This is a dragon who Assumes that others will respond according to his/her expectations. No consideration is shown for the demands which may be already on the person to whom the electronic message is sent. There may be deadlines imposed and other expectations which are unrealistic for the recipient of the message. The following is a typical example of the **A** Dragon's approach:

> Hello there!
> Students from Black Creek School in Michigan are sending you these letters as we want to establish regular weekly communication with your school.
> We hope you will reply soon.
> Best wishes.
> Michael Brane (Computer Teacher)

Such a message can have a negative effect on the parties at either end of the communication and destroy the potential for a productive telelearning environment. The **A** Dragon is most destructive to the students involved in this experience for they have sent letters with the expectation of receiving replies which may never be forthcoming. Often the **A** dragon sends the same message to a number of ID's simultaneously, which only compounds the negative influence. Even if all recipients *did* respond in the affirmative, the **A** Dragon would have further problems to address.

The L Dragon

Similar in some respects to the previous dragon is the **L** Dragon, who is overlaconic and supplies insufficient information for a satisfactory communication to be established. When initiating an exchange it is important to provide all necessary information, such as name of institution, location (especially in relation to some known city or town), ages of students, procedures expected, frequency of communication, and other parameters. The following characterizes the **L** Dragon:

> Hi,
> We saw your ID in the "Computer Pals Newsletter." Our names are Jerry, Bill, and Angela. Will you write to us?

This is hardly an adequate message to initiate a purposeful electronic writing exchange. Apart from the names of the students, there is little information given to help the recipient decide if he/she wishes to respond. Sometimes there may be a response which seeks more information about the students, only to find that they are from a very different age group. From experience, there would seem to be very little sustained communication from what the **L** Dragon initiates. Unfortunately it is often a costly and time-consuming exercise with no positive outcomes.

The I Dragon

The **I** Dragon is perhaps the most frustrating of all the electronic dragons because he/she suffers from the terrible disease of Inertia. Many of you may have experienced this frustration when you send an initial message and there is a reasonable quick response from the recipient, who agrees to establish regular communication, but then nothing ever happens! The responses to the Computer Pals questionnaire help to provide some understanding of why this inertia occurs. Often, as is shown below, there are very real and practical difficulties:

- phone lines not always available when needed, particularly where there is no dedicated line to the computer
- lines that drop out during sending and receiving
- text modem difficulties and servicing of equipment, particularly in remote areas, lack of computer expertise in the school
- lack of technical assistance close at hand

Seventy-eight percent of responses indicate that isolation of the teacher is paramount. For this reason the Computer Pals project has always had a "network" of human assistance by way of local/regional coordinators. These resource persons are only a local phone call away if any technical difficulty arises; but they do not provide servicing of equipment. The advice and guidance of these coordinators either by phone or on-line may be just what is needed to help a colleague out of his/her predicament. The responses appear to indicate that the members of the Computer Pals project are not making sufficient use of these coordinators and need to be better informed more on how to access this human support system.

The S Dragon

The S Dragon or Storage Dragon is really the most curious of all. You have met one no doubt in every electronic writing project. They subscribe to an electronic service but never read their messages. At most times these dragons find themselves with a very expensive "hobby" as they accrue substantial monthly storage charges on some systems. One can only speculate on the reasons why the S Dragon lives. It would seem that these dragons genuinely about want to establish lines of communication but in reality the demands of their work load make it impossible. Perhaps this dilemma could have been considered before they subscribed to the service? The S Dragon creates very negative feelings and attitudes in any telelearning environment as students and teachers who were initially enthusiastic about telelearning soon lose interest after being disappointed by such an experience.

The V Dragon

In many ways electronic writing is different from conventional writing (Beazley, 1990). Cost and time continue to be major influences on teleliteracy and Verbose messages place unnecessary demands on both the writer and the audience. Thus the user of electronic writing technology faces something of a dilemma as she/he needs to be conscious of the disease of "laconia" from which the L Dragon suffers and yet give sufficient information, direction, and detail to ensure effective communication. It is interesting to observe just how many teachers, in initiating an electronic link, fail to take full account of their audience, especially the social context and geographical location of that audience. Often too many messages are based on assumption. Related to the Verbose Dragon are its various cousins who, without any regard for the recipient, send long files of information. Often these are of no relevance and are on occasion just courtesy copies of files sent to other people. In most systems there is an indication of the number of lines in the message which enables one to delete it if necessary so this cousin's life is often short-lived.

The E Dragon

Whatever one writes or says about electronic writing, the subject of "Ethics" is always an underlying part of that discussion. This paper is no exception. Although in the question of whether it is courtesy to reply or acknowledge receipt of a written communication, who has the last say? Many have no doubt experienced the reply. This is the condition of the E Dragon. The Extended or repetitive reply imposes demands of time and cost on both the sender and the recipient and is not conducive to a positive telelearning environment. For those who are conscious of these demands it is in the interests of good communication to write: "There is no need to reply to this message." Then the recipient will not have strong feelings of guilt for not replying. Fortunately the E Dragon cannot live in all dungeons, since some electronic systems impose a limit on the number of replies sent to an original message.

The F Dragon

The F Dragon, otherwise known as the Forward Dragon, places responsibility on another person without using initiative to deal with the message him/herself. The very nature and ease with which the forward command can be used provides a temptation to engage in this behavior. The repercussions of such behavior may be severe. For example, consider the potential time delay in getting an adequate response to a message if the original writing is forwarded to a number of people in succession. This is perhaps the equivalent of what is known in conventional letter writing as a chain letter. While the forward command is a valuable facility for communication, if abused it can be a negative influence on any telelearning environment by setting up negative feelings in the recipient and, of course, the person who initiated the writing.

The N Dragon

N Dragons are notorious for not sustaining regular communication. Responses to the questionnaire it is clear why the N Dragon exists. This dragon is a very Negative influence on any telelearning environment as the keenness and enthusiasm of teachers and students alike are eroded by the passing of time. There are numerous reasons why the N Dragons are part of the real world of telelearning. These reasons fall into three main categories:

technical difficulties
curriculum difficulties
organizational difficulties

The technical difficulties have already been addressed to some extent in the discussion of the I Dragon. Although similar to the I Dragon in some respects, the N

Dragon is more erratic in its behavior and is subject to the vagaries of the school environment. Hence, the **N** Dragon is the victim of many human and personal problems within his/her immediate environment. There may be an illness or a death in the family, a teacher transfer, a swimming carnival which interrupts the regular communication, or short and long vacations, to name just a few of the problems. However, there are often more subtle reasons, which the questionnaire have revealed.

English is at present the lingua franca of the Computer Pals project. It is not always realized that many people involved in the various programs are writing in a second language and often lack the necessary confidence when communicating with their native English computer pals. The infrequent responses and brevity of text often reflect this reality.

Confidence in language use is a significant variable when matching students for regular communication and when evaluating the quality of the telelearning environment.

Although the possible reasons which the questionnaire brings to life are legitimate, the main failing of the **N** Dragon is that he/she never lets the other person or persons know (preferably ahead of time) why there will be or is a delay in the already-established communication.

The R Dragon

The **R** Dragon or Response Dragon is perhaps the most undisciplined of all. He/she lacks the ability to synthesis or condense a series of messages from the same person and then respond to the salient points in one complete reply. To elicit a succinct response to each message and to ensure that each point in the series of messages is addressed, it is sound practice to respond in point-by-point form as follows:

> Bill,
> Thank you for your message pertaining to the Computer Pals Environment Watch Program. Here are my responses:
>
> 1. Yes, it would be appreciated if you would coordinate the atmosphere cluster.
> 2. The program will commence on 5 June 1991.
> 3. Your Global Temperature Study is receiving many positive comments.

Regards. Malcolm.

The **R** Dragon can create quite a hostile telelearning environment as the recipient of all the messages who often accesses the system for a brief period and is faced with a barrage of separate letters from the same individual. For those who are overburdened by the amount of electronic writing and reading, condensed messages are imperative. Furthermore the R Dragon needs to be conscious of the "reply principle," which states that each message sent initiates a potential reply or series of replies. The end result of the **R** Dragon's behavior is "text overload" for the recipient, which eventually leads to "electronic writing burnout."

The P Dragon

The **P** Dragon has similarities to the I Dragon as it is often affected by the demands of time. But this dragon at least communicates. Although the communications are frequent, they never lead to anything and never reach a point of achievement. The P Dragon is in reality caught in the "Confidence" or "Hope" syndrome: Something is always going to happen, but it never does. This dragon is the cause of much frustration in a telelearning environment, because often many are waiting on the outcome of what the **P** Dragon hopes to achieve. There are many variables which create this dragon. The questionnaire responses suggest that the difficulty of getting the cooperation of other staff and colleagues is among the highest of these variables. Furthermore, the responses suggest that international communication in certain subject areas is not an easy task. For example, in Japan the responses indicate that some teachers have just begun to use telelearning in the context of Science and Japanese.

The SR Dragon

Finally, there is the **SR** or "selective reading" Dragon, which imposes delays on adequate communication. Too frequently in telelearning one or more receiving the on-line communication fail to respond to all necessary parts of the text. Often this lack of an adequate response is deliberate, but at times it may be the result of E-mail overload where the recipient of the message feels obliged to make a quick reply but does not address all the issues in the text. Users of Internet will appreciate how steps have been taken to address this obstacle to satisfactory communication by providing. an option which allows the user to reply to each part of the text. However, the recipient can still choose not to use this option!

Conclusion

The evidence from the Computer Pals' questionnaire which has been used to create the dragons of the telelearning environment suggests that there is an urgent need for both preservice and inservice education to assist educators in using the technology effectively. The training needs to be twofold: users need to become proficient at using system commands and other technical knowledge, and then they need to become adept at using the technology effectively as an educational tool. Thus it is imperative for teachers and others to have access to a support structure of the kind provided by the Computer Pals' Coordinators and International Secretariat and to learn how to use it.

Like the game "Dungeons and Dragons," not all monsters are bad. There are of course, good ones! You are the models for these, which others should emulate, and so the dungeons which you inhabit can be positive and productive telelearning environments.

Notes

The term "electronic writing" is used in this paper as a substitute for "electronic mail," as the latter term presents a very limited view of the potential of telecomputing in the context of distance education. To see Computer Pals across the World as just a penpal exchange would be to ignore the success of its wider curriculum applications.

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Highlight Session (F22)

Access to Computer-Based Telecommunications for People with Disabilities

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Keywords: disability, adaptive technology

Abstract

The resources available through on-line telecommunications offer tremendous power for people with disabilities. Telecommunications can provide equal and expanded access to hundreds of sources of information, and we have documented a number of these sources. However, making telecommunications accessible using adaptive technology can involve extensive customization.

A Level Playing Field

"Using telecommunications was the first time in my life that I had relationships with people where disability was not a factor. My disability was completely invisible, and it wasn't relevant." No one has to know you are thirteen years old, or that your voice is difficult to understand, or that you use an eyebrow motion to type. It is one situation in which the person with a disability has control over what is revealed. This was cited as a very popular feature of telecommunications, but it is also a sad commentary on the attitudes faced by people with disabilities.

Some of the most useful on-line resources for people with disabilities include books in electronic format, degree programs and other distance learning education, disability-specific conversation areas for children, adults, parents, and caregivers, legislation and advocacy information, and support groups in the areas of visual impairment, hearing impairment, environmental allergies, head injuries, spinal injuries, mental health, developmental disabilities. The ability to log on from any location will increase the potential for education and employment, via telecommuting.

Adaptive Technology with Telecommunications

With adaptive hardware and software, most on-line services are accessible to people with various types of disabilities. However, making telecommunications accessible using adaptive technology can involve extensive customization. The system must meet the requirements of the user, the software, and the on-line service. This can present technical challenges for people with severe disabilities. Some on-line services present a graphics-only interface which presents obstacles for people who are visually impaired.

A number of pieces of adaptive technology will assist in gaining access to on-line resources. Voice input (replacing the keyboard and mouse) is a very popular and increasingly affordable means of access, although voice input on the PC will not work with the America Online graphic interface. Line noise can also be a problem with a voice-activated on-line session. Full voice input for the Macintosh will be out in early 1994.

Having the words on the screen read to you can be helpful for many people. There is one set of products for people who are blind but there are less fully featured screen readers that don't require special synthesizers and are less expensive, which work for people with learning disabilities.

Enlargement can be important. There are about five fully featured PC enlargement packages for the DOS operating system, and at least one for Windows. The Mac comes with an enlargement option called CloseView.

Macros can reduce the number of keystrokes needed. These can be useful for logging on; for instance, some systems give you only twenty seconds to enter your name and password. For a slow or inaccurate typist, a single keystroke could produce the proper text.

On-screen keyboards can be used in conjunction with a mouse, infrared input device, or a trackball. Some on-screen keyboard software programs also include word prediction. Word prediction can reduce the number of keystrokes required to type words and phrases. You type the first letter of the word and up to nine full words are displayed. If the word you want is one of the choices, you enter it by typing a single number or hitting a space bar. If your word is not displayed, typing the second letter of the word will cause the choice to improve. Some word prediction systems learn, making them increasingly accurate at predicting words.

Adaptive keyboards can be used on all computer platforms. They can usually be customized according to the needs of the user and specific software packages. The user might want to touch one key on the board to move to an area on the screen, dial a number, or send text. Single-switch input can also be customized using similar interfaces, for individuals who use single switches to activate the computer.

Highlight Session (F23)

Global Interaction in Elementary Education: The Air Project — A Curriculum Focus

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Keywords: curriculum, elementary, global, telecommunications, science

Abstract

The Air Project involved elementary students in a curriculum-based telecommunications study focusing on air. Students in New Zealand, Australia, and the United States communicated their studies with one another via the Internet.

The 1993 Water and Air Projects are curriculum-based models for global interaction in elementary education. These international projects are the continuation of the 1992 Water Project. In 1993, Air was added as a curriculum-focused study. The participants shared and compared information via electronic mail exchanges on the role of air and water in their area via the Internet. They worked within a predetermined framework so that goals and expectations could be met by all students and teachers to be consistent.

The projects feature elementary students ages nine through twelve years in public, private, urban, and rural schools. Each curriculum study was divided into four modules in addition to an introductory unit to allow the students to "get to know each other." The first module was titled "Why Do We Need Air?" and focused on the importance of air in their location, the effects of air pressure, and measuring air temperature. In module two, students began to look at causes and effects of air pollution, acid rain, and global warming. Module three included studies of commercial and recreational uses of air. Module four included the culmination of the study with "Clean Up Our Air World Campaign." Ideas were generated and implemented to make a difference in the air we breathe.

The Air Project pervaded all curriculum areas, including language arts, science, math, drama, art, and social sciences. Some of the activities included measurement of temperature, measurement of air pressure, summarizing findings to transmit to counterparts, dramatic presentations of findings in addition to continuous communication in cooperative groups. Throughout these projects, it was rewarding to observe the additional interest that students displayed when sharing and comparing their findings electronically. In addition to the increased motivation, students became more culturally aware of people in other countries.

Highlight Session (F24)

Oh! Telecommunications: Projects That Produced Results and Why

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Keywords: curriculum applications, K-12, projects, planning process

Abstract

This presentation will provide an overview of several curriculum-based projects using telecommunications as the medium of exchange. What makes a kindergarten-grade 12 telecommunications activity work? Two veteran teachers will give a detailed explanation of the steps common to exemplary projects they have used in their own classrooms. As more and more K-12 educators discover the captivating connections available with telecommunications, they need a road map to avoid the detours and barriers along the highways of the networks.

The presentation will be broken into three parts. First, these teachers have determined that there are consistent guidelines for using telecommunications activities within a classroom setting. The presenters will discuss the models which have provided frameworks for projects that have captivated their students. Second, the presenters will show slides of their students participating in exemplary curriculum-based projects in their schools in British Columbia, Canada, and Roanoke, Virginia, USA. The grade levels of the projects range from lower intermediate through high school levels, ages 9 to 18. Third, questions from the audience will be entertained.

Highlight Session (F25)

Survey of Statewide Educational Telecommunication Networks

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Keywords: network, networking, state, telecommunications, NREN

Abstract

This study examines the current status of each state's activities to operate and maintain a statewide instructional network to serve students and educators. It is based on the results of a national survey conducted by Educorp Consultants to inform state leaders, service providers, and federal policy makers. Approximately 80 percent of states have statewide networks in operation or planning stages. The growth is significant over the past three years.

Relevant Research

In a 1990 report on statewide telecommunication networks (Kurshan, 1990), Kurshan described phenomenal growth of classroom applications at the K-12 level. The most frequent applications at that time supported solely administrative and resource sharing activities. The report concluded that expanding network use would depend upon improved access, infrastructure development, options for connection to the Internet, and the quality of information transmitted. There also was a need to create new types of alliances among educators, business leaders, government representatives, and information providers.

Few studies have been conducted on educational telecommunications since 1990 because of outstanding questions surrounding the development and direction of the National Research and Education Network (NREN) and its connection to the Internet. However, in 1993 a number of political and technological forces have resulted in an increase in legislative proposals. Examples of these forces include the Clinton Administration's support of the "electronic superhighway," the establishment of the Consortium for School Networking (CoSN), the pending Technology for Education

Act, and the creation of a Technology Leadership position in the Department of Education.

The combined effect of these efforts has led to a rapid increase in the accessibility and use of networks in K-12 classrooms. But little is known about the nature of this increase in network usage and its impact on instructional practices other than what has been revealed by a limited number of surveys and case studies that focus on various factors addressing network use.

Much of this research is based on anecdotal and survey data of varying quality and reliability. Thus, the information base for making decisions about development strategies and user needs of telecommunication networks is not well formed. This survey addresses the lack of data which is current for the decision-making process

Recommendations

The survey data are separated into four categories: logistical infrastructures, instructional features, transport system, and support systems. One major finding and recommendation in each area is included below. These and many others are included with the state-by-state data in the full report.

Logistical Infrastructures

- Although most states offer both local and 800# dialup access, they need to develop partnerships which promote low-cost access throughout the state.

Instructional Features

- While almost half of those states that responded do provide an electronic mail gateway to the Internet, only eleven states allow users to Telnet and FTP to other computers on the Internet. Unfortunately, this low number may give the federal government cause to wonder why the K-12 community should be involved in the development of the NREN.

Transport System

- A wide range of software and hardware is being used by each state for the host end of the transport system, partly as a result of the different types and complexity of services provided by and needed for in each state. However, more research is needed to determine whether the computer and software industry can provide states with effective systems for operating statewide networks for education.

Support Systems

- Five states reported state network budgets between $500,000 and $5 million. The rest use the piecemeal approach, collecting university and corporate grants, local funds, user fees for on-line time, etc. States need to have a stable budget from a limited number of sources if the goal is to develop a permanent network to support education.

- There is little formal and/or independent evaluation of network effectiveness to determine if the network is in fact meeting the needs of the state's educational community.

Outstanding Questions

- Does a state's level of satellite and fiber-optic use for distance learning correlate positively or negatively with the use of telecomputing networks to support instructional activities?
- Are states integrating the use of these technologies in complementary and tandem approaches within any given curriculum?
- Further research needs to be done to determine the extent of current connections to commercial services. However, even without the benefit of research it is clear state leaders need to explore the possibilities specific to their networks.

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Highlight Session (F21)
Technology in the Bureau of Indian Affairs' Schools

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This panel will present to students, teachers, and administrators information and ideas related to the educational use of telecommunications in Bureau of Indian Affairs Schools, many of which are located in rural isolated areas. The panel will provide an overview of several distance education applications, including the use of satellites, bulletin boards, E-mail, access to Internet information resources projects, administrative applications, and on-line staff training in bureau schools. The session will allow for input and questions after the panel presentations.

Panel Session (F41-HO)

I*EARN Activities: Linking Youth in Order to Heal the Planet

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Keywords: healing, youth, global, education, telecommunications

Abstract

*This presentation will draw upon the experience gathered in the I*EARN (The International Education and Resource Network). I*EARN is a research network of about four hundred schools in 23 countries of the world. The purpose of I*EARN, is to assist youth, globally, to make a meaningful contribution to the health and welfare of people and the planet using telecommunications. There will be a presentation of completed student projects, a discussion of the infrastructure of I*EARN and examples of how teachers have created ways for this work to "live" in their educational process.*

*Additionally, there will be a discussion of new developments (The PLANET Project) in which other educational-telecommunications networks — AT&T, PBS, TENET, Big Sky Telegraph, FredMail, as well as I*EARN — are working collaboratively, across networks, to achieve the same purpose as I*EARN. Also included will be a description of a plan to involve and cross link international youth-service organizations such as Save The Children and World Scouts Environment Network (The GLOBE Project).*

Poster Session (F41-LB)

Exploring Educational Telecommunications: A Twenty Hour Workshop for Teachers

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Keywords: education, telecommunications, workshop, Internet, BBS, modem

Abstract

This poster session presents an educational telecommunications curriculum which was developed for a twenty hour technology workshop for teachers. This workshop is oriented to beginning telecommunications users. It covers basic telecom setup, theory, and practice (over 50 percent of class time is spent with students on-line). It is intended to give students broad experience using telecoms, rather than in-depth knowledge of a single area. There is an emphasis on the variety of on-line educational resources available to teachers. Fun rather than expertise is the tone of the class.

Preparation

Students had access to an Internet host via Kermit running on PCs (used as dumb terminals). They also had access to stand-alone computers (DOS and Mac) with modems and phone lines. Guest accounts were requested for a variety of commercial and non-commercial BBSs. Brochures and other print information for some of these resources were gathered. E-mail penpals were arranged for. A variety of handouts for each session were produced, and an extensive bibliography of resources and publications was compiled.

Topics Covered

A very brief summary of topics covered follows:

Day 1/What is Telecommunications: Electronic communities; what are LANs and WANs; experience using E-mail in a mainframe (UNIX) environment; how to buy, compare, and install telecom hardware and software; telecom terminology and settings; practice dialing a local data line (public library) or other data resource.

Day 2/On-line Services and Bulletin Boards: The history of Fidonet; using a modem to connect to commercial services; PDNs; exploring several services and comparing features including ease of use and what is available on the service. Students complete an On-line Resource Evaluation form for each resource they contact for the remainder of the week.

Day 3/The Internet: What is Internet; what you can do with it; problems of an "organic system"; using Telnet; exploring some Internet resources; Bitnet and listservs; using USENET.

Day 4/Telecom in Education: Using telecom in an educational setting; overcoming barriers to using telecom in the classroom; what resources are available; lesson plans and activities; FrEdMail; state education networks; exploring some education telecom resources.

Day 5/File Transfers: The theory and practice of file transfer protocols; using FTP, Gopher and Archie; uploading and downloading files from micro to mainframe and BBS; Telecom culture.

Conclusion

This workshop was evaluated highly by students. Students appreciated having the opportunity to pursue their own interests in regard to topics and resource choice. At least half the students became primarily interested in Internet and practiced using it extensively outside of class. These students tended to have had some experience with telecom before the class.

Panel Session (F42)

Standards for Telecommunications in Teacher Preparation

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Keywords: telecommunications, accreditation, standards, teacher education

Abstract

Standards have been developed by ISTE and approved by NCATE for technology use in teacher preparation programs. These require experiences that prepare teachers to use telecommunications to support and enhance both school curriculum and their own productivity. These standards are useful for designing and evaluating teacher preparation programs and for assessing personal skills.

Introduction

Telecommunications is playing an ever-increasing role in education. Students will take their places as adults in a society that values information and values the tools for accessing, using, and exchanging information. For education to be relevant and to prepare students for their future, teachers must acquire knowledge, attitudes, and skills which empower them to use telecommunications with their students and to enhance their own productivity and professional growth. The International Society for Technology in Education (ISTE) has developed standards for teacher preparation which have been adopted by the National Council for Accreditation of Teacher Education (NCATE), the body designated by the U.S. Office of Education to evaluate teacher preparation programs.

Telecommunications Standards

The ISTE/NCATE guidelines address teacher preparation programs in (1) computer/technology literacy, (2) secondary computer science education, and (3) advanced educational computing and technology leadership. Within these program areas are a group of standards identified as *Foundations,* which ISTE regards as essential for all teachers regardless of area of specialty. The *Foundations* include these requirements regarding telecommunications:

- demonstrate knowledge of uses of computers for communications;
- demonstrate knowledge of telecommunications activities to support instruction;
- use computer-based technologies to access information to enhance personal and professional productivity.

Additional requirements are identified for candidates who are enrolled in programs that specifically prepare them to teach computer/technology literacy as a curriculum specialty. These programs must include experiences with information access and delivery applications that provide:

- functional knowledge of telecommunications tools and resources;
- functional knowledge of the utilization of telecommunications for information sharing, remote information access and retrieval, broadcast resources, and distance learning;
- knowledge and application of information access and delivery tools to support and enhance the curriculum and develop problemsolving skills; knowledge of networked systems;
- functional knowledge of methods and strategies for teaching the use of information access and delivery tools.

Advanced programs (e.g., masters') in educational computing and technology leadership must address all of the previous requirements as prerequisites to the program or within the program. The leadership program includes experiences that provide:

- functional knowledge of networking systems appropriate for K-12 schools;
- information access and delivery tools and resources and their uses across the curriculum.

As teacher education institutions refine their programs to address the ISTE/NCATE standards, telecommunications will become an essential component of the preparation that candidates receive.

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Cluster Session (F43A)

Recent Trends in the Planning and Implementation of Educational Telecommunications: National, Statewide, and Local Perspectives

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Keywords: educational telecommunications, distance learning, decision making, planning, funding, policy development

Abstract

Effective planning for educational telecommunications depends on the interactions of key organizations at the national, state, and local levels. Important planning issues to be considered include the influence of federal policies and funding programs, the basis for policymaking, and student, faculty, and district needs for information. The delivery of programs for students and the acquisition of hardware for delivery are additional concerns of educational telecommunications planners.

Decision making for the use of telecommunications in education — like other educational initiatives — takes place at the national, state, and local levels. At each level, considerable differences in the scope and type of activities prevailed. Still, decision makers in the national, state, and local arenas are not autonomous, and the decisions made at any one level influence the entire field of educational telecommunications.

Understanding the confluence of national, state, and local planning for educational telecommunications — and the way in which the planning activities interact — is essential for the development of effective planning at any one of the levels. For each level of decision making, key organizations, their goals and activities, and their relationships to interplay with decision makers from other arenas will be related.

According to continuing research in educational telecommunications planning conducted by Hezel Associates over the past six years, several important planning issues emerge.

First, while states surface as the central agent for educational telecommunications planning, their plans are, in turn, influenced by local planning, especially local needs assessments for educational programs. States are also influenced by federal policies and funding programs. In search of federal monies, some states have been known to mold their own educational telecommunications programs to the funding priorities of the federal government. What is the basis for policymaking in educational telecommunications? The federal government and each state have established policies in education and, usually quite independently, in telecommunications. In fewer than half of the states have education and telecommunications policies been considered jointly, especially at the legislative level, with the goal of a coherent policy on educational technology, educational telecommunications, or distance learning. At the state education agency level, however, nearly every state has in place some form of educational telecommunications planning and policy guiding the planning. Naturally, the quality and scope of the state efforts vary widely.

At the federal level, much of the policy development has consisted of funding policy. Initiatives such as Star Schools, the Public Telecommunications Facilities Program, and the Rural Electrification Agency have focused on funding and not on the articulation of broad policy for educational telecommunications. Only recently have various branches of the federal government embarked on policy development. The Department of Commerce and its National Telecommunications and Information Administration have begun to work with education agencies to articulate good policy in education and telecommunications. The U.S. Department of Education has created an office to treat educational technology issues. Some form of policy on telecommunications is likely to issue from that office.

The development of educational telecommunications at the local level most often focuses on the aggregation of student, faculty, and district needs information, the delivery of programs for students, and the acquisition of hardware for delivery. Because local educators are most often confronted with practical issues of where to find information and programs that their students need and how to obtain the necessary equipment to use telecommunications for instruction, they tend not to devote time and energy to the articulation of technology policy. Nevertheless, local school districts are remarkably affected by the telecommunications policies created at the federal and state levels.

Ultimately, the development of telecommunications policy at the federal, state, or local level requires the recognition of the role that other levels play. If the U.S. is to have a sound system of telecommunications for education, federal, state, and local agencies must collaborate on the assessment of needs, making of policy, and delivery of programs to schools.

Cluster Session (F43B)

Outcomes of Electronic Connectivity on the Curriculum at the University and K-12 Levels

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Keywords: telecommunications, K-12, technology, network, modem, Internet, connectivity

Abstract

This summer, the Hawaii Department of Education began a project to network computers in all classrooms. Some major goals are to provide E-mail and Internet access to all teachers and students. This presentation examines the network development process from initial teacher training, to various stages of network implementation at two representative schools. Interaction with faculty at the University College of Education is also examined.

Phase One: Teacher Training for School Networking

During June 1993, the District of Honolulu initiated a pilot group of thirty computer resource teachers who were trained to use the telecommunications services available on the Internet, such as Telnet, Gopher, USENET News, FTP, E-mail, listservs, and the search engines Archie, Veronica, and WAIS. The pilot group of teachers were established as a "Trainer Corps," charged with training teachers at their home schools when the school year resumed. A Unix workstation was then set up, in cooperation with the University of Hawaii, as the gateway to statewide and international communications for all teachers and students. This venture represented a perfect opportunity to formulate and test policies granting Internet user accounts to teachers and students, and to gradually bring them on-line as experience was gained. Another policy was formed that students would be granted access only after their own classroom teachers had been trained by the original pilot teachers to use the gateway system and the available Internet services. Teachers would be expected to formulate and submit a curriculum plan that demonstrated how the new technology would be integrated into their classroom activities. This insistence on training before use would ensure that the new communications capabilities would be closely tied to the curriculum. It also served to regulate the flow of new users, giving the system operators time to plan expansion in response to gradually increasing usage. Another policy created was that parents were to be fully informed of the intended student network access. Consent forms were to be signed by parents, granting schools permission to arrange access by the students and to deny access to students who abused the service.

Phase Two: Bringing Schools On-line

On Saturday, August 29, 1993, with much media fanfare, volunteers from the ranks of parents, teachers, school administrators, district and state technology resource personnel and local telephone company employees met at an intermediate school in Honolulu. They drilled holes, pulled cables through walls and underground conduit, made connections, and installed network hardware and software. This would be the first public school in Hawaii to receive its own campus ethernet network with a high speed direct connection to the university and Internet. In contrast, a second school, not included in the pilot network project, made plans to participate in its own way in the information revolution. Teachers at the school did not intend to patiently wait for progress to reach them unassisted, because they were well aware that a vast library of resources was waiting for them on the Internet. It was decided to forgo the expense of installing a campuswide network, but funds were found to install a single phone line to be shared by four classrooms and to purchase a modem for each classroom. Under-utilized computers that were previously in a lab setting were distributed to classrooms to be integrated into the daily curriculum. Investigation then began into how teachers and students could get user accounts on the Internet.

The University Connection

The College of Education at the University of Hawaii also installed an ethernet network during 1993, presenting an opportunity for its faculty to interact with teachers in the schools in unprecedented ways. Training in all Internet services was conducted, as few of the college faculty and staff had previous experience. Faculty engaged in supervision of student teachers were especially interested in corresponding via E-mail with their students. One faculty member proposed that observation/participation students assigned to the second school described above share university user accounts so that the teachers and children of the school could get on-line and enjoy the excitement of exploration on the Internet in anticipation of the school, getting an official entry method.

Cluster Session (F43C)

Models for Effective Use of Distance Learning Technologies

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Keywords: instructional telecommunications, learning theory, modality theory

Abstract

Hardware developments have historically outpaced courseware developments. We can often implement innovative and potentially effective learning interventions long before we know how best to do so. We shall argue for a multidisciplinary, theoretical

foundation upon which to base research in the area of instructional telecommunications.

Dijsktra (1976) has argued that computers have not solved a single problem. Rather, computers have provided us with a new problem — the problem of learning how to use them effectively. This shrewd observation is even more poignant twenty years later in the domain of learning technologies. It is obvious enough that it is the particular use to which a technology is put that solves or fails to solve problems. The general type of problem to be solved by various learning technologies is an optimization problem: Given that various computer-mediated learning environments are possible and given specific instructional objectives (e.g., train apprentice technicians to operate and maintain a device; teach fifth-grade students United States geography; etc.), what is the optimal way to present and structure learning opportunities?

This optimization question has many facets. It surely involves a learning component, a cost component, and probably an organizational or cultural component. Because the cost component is often viewed as representing the final arbiter among choices, attempts at optimization tend to simplify the learning situation in order to make it possible to calculate costs. The result is that long-term research questions are set aside in favor of short-term preferences. For example, if an organization feels obliged to push computer-assisted learning (CAL) as an essential part of its corporate image, then certain kinds of studies and analyses are conducted to show that CAL is cost-effective, at least in some situations. As a result, studies have typically treated a particular medium as an independent variable to manipulate for an entire course or course module. The assumption is that a particular medium is suitable for delivery of all of the learning involved in a particular unit of instruction.

Unfortunately, real-world learning is often more complex and varied than allowed or imagined in most learning studies. Rather than conducting studies to determine if television is as effective as lecture with discussion, a more realistic approach would be to establish which kinds of learning each medium can support. Some media cannot support certain specific learning objectives, while others can only marginally support some objectives. Many of these cases are obvious (e.g., it is difficult to use text-on-screen to train psychomotor skills)

A taxonomy of learning objectives and media can be derived from existing studies and research in the area of learning technologies. An initial taxonomy should consolidate what users report as possible and possibly good. What is then needed is a theoretical basis on which to make generalizations and predictions about new and emerging technologies. Cognitive learning theory provides part of this basis, although there is much about human learning that has yet to be established within cognitive (or any other) learning theory.

A second theoretical component can be derived from information or communications theory. For example, cognitive learning theorists might suggest that the limitations of working memory are crucial when planning instructional environments or that instructional computing systems that are interactive are likely to be more effective. What is missing is an account of what counts as a chunk of information or what counts as a kind of interaction. Cognitive scientists and communications theorists have addressed these issues (Friedman, 1993; Gathercole & Conway, 1988) with somewhat patchy results. For example, which modality (visual, auditory, tactile) is optimally effective in a specific learning situation is not generally known. Moreover, within a specific modality, how to couple that modality closely with the content to be learned (e.g., match a particular graphic image with a learning objective) is also not well established.

In short, distance learning must confront all of these issues plus the attendant costs of using an emerging instructional technology. The initial assumption should be that a particular distance learning technology (e.g., satellite delivery or electronic mail) will be integrated at design time into the entire curriculum or course. Single-medium models are seldom cost-effective and fail to reflect the reality of most learning situations. Moreover, the complexity and variety of instructional delivery systems require that the best of both cognitive science and communications theory be made an integral part of any new large-scale learning technology research and development effort.

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Cluster Session (F44C)

Multimedia in Bilingual Cultural Exchange Programs Via Computer Networks

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Keywords: multimedia, cultural exchange, high school, L2, research

Abstract

An electronic bulletin board at UNAM served as the vehicle for a bilingual cultural exchange program between high school students in Mexico and California.

Communication via E-mail was supplemented with final projects in multimedia. Both quantitative and qualitative research results indicate that this is an interesting alternative to traditional methods of learning L2.

Since 1991 an electronic bulletin board has served as the vehicle for a bilingual cultural exchange program between high school students in Mexico and California. The Academic Computing Center, the Foreign Language Center and the National High School System have been awarded a grant by the Universidad Nacional Autonoma de Mexico to develop a prototype for innovative teaching with computers.

Project objectives include:

1. Developing a model for cooperative learning via telecommunications based on:
   a. social interaction instead of isolated individual processes;
   b. real-life problem solving rather than the acquisition and retention of facts;
   c. the opening up of the classroom to include libraries, data banks, the community, other communities, etc.
   d. the integration of computer, telecommunications, multimedia, and other information technologies in the curriculum.
2. Analyzing the changes in the students' conception of the process of learning foreign languages and in their attitudes toward language learning, groupwork and technology as well as members of other cultures.

Standard grammar and reading comprehension tests from the Foreign Language Center were applied to both experimental and control groups at Escuela Nacional Preparatoria No. 6. The entire course for the experimental group was dedicated to the cultural exchange via telecommunications, whereas the control group used a grammar and reading comprehension textbook in a traditional manner. A comparison of the results of the grammar pretest posttest shows that the progress of the experimental group was statistically more significant than that of the control group with a level of alpha equal to .05.

Results regarding reading comprehension indicate that instruction in this area must be integrated into the learning model.

As for qualitative results, if we define culture in an anthropological and social sense as including: attitudes, values, thought patterns, frames of reference, and daily activities, we can say that electronically mediated exchange programs increase contact with the culture of L2. There is a confrontation between the ideas, values, and attitudes of the culture of L1 and L2. The contrast seems to provoke criticism and analysis on behalf of participating students. They selectively criticize the other culture and their own and begin to analyze what is happening in the world around them from the perspective of the newly acquired knowledge. It is also pertinent at this moment to evaluate what impact this cultural confrontation and the presence of a real audience have on the learning process. Results indicate that intercultural exchange programs facilitate the development of high-order thinking skills such as analysis and synthesis and personalize the learning process, producing quality content and commitment in student work, not to mention their role introducing students to the benefits of modern telecommunications systems.

This presentation also discusses the technology necessary for multimedia cultural exchange via telecommunications networks.

Cluster Session (F45A)

Faculty Development and Telecommunications: A Team Approach Works!

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Keywords: distance education, faculty development, compressed video, telecommunications, bulletin boards, copyright

Abstract

This session will present a current faculty development telecommunications project at Montana State University funded by US West. Featured will be review of one of the grant activities which will involve the intra-institutional team design and teaching of a telecommunications course using the compressed video and electronic bulletin board components of the Montana Educational Telecommunications Network (METNet).

Background

During 1991-93, the Montana Educational Telecommunications Network (METNet) installed three components of the state network: electronic bulletin boards, compressed video, and satellite downlinks. During 1992-93 Compression Labs, Inc., Rembrandt II VP compressed video units and seventeen regional bulletin board systems were installed. This network makes available many distance education opportunities for delivery of coursework, staff development, and video-conferencing. As of November 1993, six compressed video sites have been installed: Bozeman, Billings, Missoula, Helena, Kalispell, and Miles City.

Project Summary

Due to an instate grant from US West Foundation awarded in March 1993, Dr. Bruwelheide will coordinate, design, and deliver courses and staff development for faculty and teachers using the METNet technologies of compressed video and the bulletin board systems available in Montana during the 1993 academic year. One aspect of demonstration is the team design and delivery of a three-credit telecommunications course to be taught over the network during spring semester 1994. She and Dr. Brehm will team design and teach a course between Eastern Montana College (Billings) and Montana State University (Bozeman) beginning spring semester 1994. Delivery will perhaps be extended to Miles City and Kalispell so that three or four cities, geographically separated, will be involved in a live, two-way, interactive course. Primary instruction will be over the compressed video system. Computer networks and bulletin board systems in Montana will be used for class exercises, conferencing, and file sharing, demonstrating that telecommunications technologies can be integrated into an instructional experience. A major component of the class will be the Internet and problem solving with telecommunications. The title of the course is "Telecommunications for Educators."

Dr. Bruwelheide teaches instructional media courses and serves as telecommunications and outreach coordinator for the college. She taught the first compressed video courses over the network to four sites during spring semester 1993 and will share experiences concerning policy concerns, teleteaching techniques, course design, and copyright considerations for multisite delivery. She is nationally recognized as a copyright consultant and is currently revising *The Copyright Primer: A Handbook.* She wrote a chapter on copyright and distance education which is included in *Distance Education: Strategies and Tools* available fall 1993.

Dr. Brehm teaches educational technology courses and specializes in instructional computing and telecommunications. A special interest is using telecommunications for problem-solving. She edits the newsletter published by the Montana Council for Computers in Education.

Project Objectives

1. A faculty distance education resource person and cadre of faculty will be trained to use METNet with a "train the trainers" approach.
2. At least one course and a staff development (inservice) presentation will be delivered over the METNet during the academic year 1993.

3. Faculty from different institutions will design and teach a course over the network beginning spring semester 1994.
4. The METNet technologies will be used to teach the system over the system.

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Cluster Session (F45C)

Enhancing Televised Distance Learning with Computerized Technology

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Keywords: distance learning, electronic information exchange system, computer mediated conferencing, virtual classroom

Abstract

NJIT has invested in a "candid classroom," an actual classroom /TV studio, where live presentations are broadcast and also taped for delayed use in local and nationally accredited courses. The Department of Computer and Information Science (CIS) is currently offering a complete undergraduate degree in information systems via distance learning supported by a grant from the Sloan Foundation.

Introduction

NJIT's computerized conferencing system, the Electronic Information Exchange System (EIES), has been coupled with the televised lectures to maximize student involvement and increase access to instructors, advisors, and other students.

EIES, designed and developed at NJIT, is a computer-mediated system that serves as an electronic meeting place. MAIL and CONFERENCES are two functions that can be used as ways of communicating. EIES keeps permanent records of all conversation transactions (mail messages, conference items, etc.) and organizes them for subsequent access. The system was used by more than 700 students last semester, both on and off campus.

The authors discuss issues related to the integration of computerized conferencing to support distance learning courses. Also, a description of EIES capabilities and features, including the Virtual Classroom, are presented.

NJIT has recently been awarded funding from the Sloan Foundation to develop, offer, and assess the effectiveness of an undergraduate major in information systems delivered via a combination of video plus Virtual Classroom. As a result, improvements will be made to provide a richer, more robust version of EIES.

EIES and the Virtual Classroom

The Virtual Classroom is the name for NJIT's teaching and learning environment constructed in software, as enhancements to EIES. The "heart" of the environment is a series of conferences for each class, where plenary discussions take place and "electures" (lectures in electronic form, interspersed with questions) are presented. Students may access the VC 24 hours a day, seven days a week.

Though many E-mail and bulletin board systems are used to support educational delivery, no other system was designed specifically to support collaborative learning on an asynchronous (anytime, anyplace) basis. "Collaborative" means that students learn together and work in groups on projects, which enhances both motivation and the effectiveness of learning. Individual instructors must completely rethink, reorganize, and prepare their courses to be delivered via video plus Virtual Classroom. For the video portion, it takes more than a month to plan and prepare all of the materials for a complete set of course tapes. Instructors must also plan the VC portion of the course, including designing new types of assignments that involve collaboration among students and preparation of the material for upholding to the VC during the appropriate point in the course.

EIES features, such as activities, are executable programs that are attached to an ordinary conference comments. Activity types include QUESTION/RESPONSE, which is the most frequently used. The author of a Question/Response activity has many parameters that can be set to tailor the interaction. Responses may show the full name of the student, be entered anonymously, or allow the respondent to decide whether or not to reveal his or her identity. Each person MUST ANSWER BEFORE SEEING THE RESPONSES OF OTHERS. This is very important for making sure that each person can independently think through and enter his or her own ideas, without being influenced by responses made by others. Many instructors say that QUESTION/RESPONSE is a much more productive way to handle questions.

Conclusion

It is not the hardware and software technology alone that provides the potential for improvement in the educational process. A key component is the pedagogical techniques or social technology of the process whereby learning is facilitated and encouraged. The major educational process coupled to the technology of computer-mediated conferencing is that of collaborative learning.

Fadi Pierre Deek

Joining NJIT in September 1986, Mr. Deek has, since 1989, been the director of CIS undergraduate curriculum. In addition to teaching, he manages three undergraduate degree programs in computer science and information systems.

Mr. Deek designed, developed, and delivered on NJ Cable Television Network two telecourses on programming and problem solving. He is the recipient of three Excellence in Teaching Awards from NJIT .

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Mr. Terry has been the executive director of computing services since October 1988. He is responsible for all phases of academic and administrative computing, telecommunications, and network management for a computer-intensive, technical university with 7,700 students and 1,000 staff utilizing 15 computers, 250 workstations, 5,300 personal computers, and 300 terminals. He is also the director of the computerized communications and conferencing center(CCCC), the EIES service provider.

Previously Mr. Terry was MIS director and research manager at various aerospace corporations and a commissioned officer in the United States Navy.

Cluster Session (F46A)

The CISO Project: Toward a Communication and Information System for Dutch Education

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Keywords: telecommunications, national network, information and communication services, recommendations, information technology in education, tele learning

Abstract

The CISO Project is aimed at the investigation of the various factors that need to be considered in the implementation of an on-line communication and information system for Dutch education. Involving partners from the national telephone utility, the Ministry of Education, universities, and schools, this large-scale national-level project is generating insights and recommendations for the many interrelated aspects of such a system. The presentation will present the recommendations coming from the project.

The Dutch-European Context

The Netherlands is a small, densely populated country in the center of the European Community. Like elsewhere, the rapid technological developments in society and rapidly escalating interconnectiveness within Europe and with the rest of the world are reflected in the sorts of educational developments that are occurring. Even in such a small country as The Netherlands, the need for and use of telecommunications in education is becoming a necessity. From the early 1980s onward, the stimulation and introduction of information technology in education have been coordinated by the Dutch central government.

At first, many different projects aiming at the introduction of computers in classroom practice, have been realized. In recent years the national policy has mainly been focused on the supply of hardware, software, and inservice training of teachers, principals, and system operators. At the same time a large-scale restructuring of the Dutch school system is taking place that will be completed in 1994. An ongoing dilemma (Collis, Veen, & De Vries 1993) for educational policymakers in The Netherlands and elsewhere is that it is often difficult to harmonize stimulating innovations and preparing for future trends in society with the ongoing needs and demands present in the educational system. The restructuring of the school system is such an ongoing need. This dilemma becomes particularly challenging with respect to telecommunications. It is apparent that in the European context, different countries have taken very different approaches to the topic of telecommunications and education (Danish Ministry of Education, 1993). The Danish Ministry, for example, has invested heavily to make telecommunications applications available to the country's schools. The Dutch government on the other hand, has given low priority to telecommunications in its overall policy for information technology in education. The CISO Project therefore is one of the first of this kind to focus solely on telecommunications use in education.

What is the CISO Project?

The CISO Project takes its name from the Dutch words "Communicatie en Informatie Systemen voor het Onderwijs," which mean "Communication and Information Systems for Education." The project, which started in late 1992 and continues through 1993, has as its general goal: ...to contribute to the long-term development of the use of telecommunications for communications and information-related activities in the Dutch educational system.

The project will make this contribution most directly through a set of recommendations relating to the successful establishment of an educationally oriented on-line communication and information system for Dutch schools.

In order to come to these recommendations, the project is stimulating a variety of activities and explorations relating to on-line applications in Dutch education. A major activity in this respect is the participation of eight teachers from four vocationally oriented secondary schools whose experiences with a variety of existing on-line communication and information systems are being carefully supported and observed.

Who are the Partners in the CISO Project?

The CISO Project is sponsored by two groups: the Dutch PTT (the national public utility for telephone and telecommunications) and "PRESTO." PRESTO is the name of a program cooperatively supported by three Dutch Ministries — Education and Science; Economic Affairs; and Agriculture, Environmental Protection, and Fisheries. PRESTO's task is to stimulate innovative lesson materials and instructional practice through the use of new technologies for middle-level vocational education in The Netherlands. The CISO Project is being carried out by representatives from three universities; the University of Leiden (through its associated "Parliamentary Documentation Centre" [PDC]), the University of Twente (through its Faculty of Educational Science and Technology), and the University of Utrecht (through its Institute of Education). A total of eleven persons from the three universities are directly involved in the project. The component of the CISO Project involving school and teacher experiences is being carried out at four middle-level vocational institutions, and involves two teachers from each of these schools as well as other persons in the schools whose interaction with and support of the teachers is part of their telecommunications-use situation.

What are the Specific Focuses of the CISO Project?

In order to come to recommendations for an eventual educationally oriented on-line communication and information system to be successful in the Netherlands, many different and interconnected issues must be considered. The CISO Project is attempting to elaborate on as many of these interconnected issues as possible in its set of recommendations. In particular, the project is focusing on recommendations about such issues as the following:

- the identification of educational needs, at the student, teacher, class, school, and system levels, that can be addressed through the provision of an educationally oriented on-line communication and information system
- the identification of factors at the individual, class, school, and educational-system levels likely to influence, positively or negatively, the use of the on-line system
- characteristics of the on-line system itself, including its different categories of contents, its organization, the types of facilities available to the user when working with the system, the strategies available for user access and handling of the system, and user-interface issues
- characteristics of the software through which teachers and students interact with the on-line system
- issues related to the large-scale provision of on-line services for education, including strategies for initiation of these services, responsibility for management and maintenance, ownership, financial considerations, and factors influencing decision making and policy about the system

- strategies for stimulating interest in and demand for on-line services within education, and for harmonizing the supply-side of the on-line services with the demand-side
- the identification of educationally relevant lesson activities, particularly as a first focus for middle-level vocational education, that are facilitated by on-line communication and information systems
- strategies for teacher inservice and support relative to use of on-line systems for professional and lesson-related activities
- issues at the teacher, school, and educational-system levels relating to the costs of on-line use and ways to obtain convenient on-line access
- performance indicators for assessing the on-line system

The integration of these and other components all related to the eventual success of an on-line communication and information system for education into a practical set of recommendations, with ongoing reference to feasibility and cost-benefit implications of the recommendations, is the major task of the CISO Project team.

Methodology and Timeline

A complex mix of methods and sources of information is needed to accomplish the task of the CISO Project — the making of an interconnected set of recommendations relating to the successful establishment of an on-line communication and information system in The Netherlands. The schools and teachers participating in the project are the source of considerable information. Teachers' diaries and interviews, classroom observations, and group interviews with teachers, principals, and system operators are used to collect data. Besides, experts experienced with different aspects of educationally oriented on-line communication and information service are also interviewed. Furthermore, the general accumulation and analysis of information from other on-line projects, both in and outside of The Netherlands, is also an important strategy of the project.

During the project's first months, beginning in late 1992, activities focused on establishing the project and its procedures; establishing relationships with the schools and teachers to be involved in the project; becoming familiar with a range of already-available on-line services, and developing introductory lesson materials about those services for use within the project; and the launching of various types of contacts among experienced users of educationally oriented on-line services in order to systematically begin to capture their experiences and recommendations. During the project's middle portion, the first half of 1993, considerable attention was given to the inservice training of the teachers involved in the project, as well as their ongoing support. An electronic help-desk service was established, teachers were supported in their investigation of on-line services, specially developed data communication software for convenient on-line work was supplied to the teachers, and a number of strategies were developed to systematically capture the teachers' on-line experiences and their opinions about the educational potential of those experiences. Information accumulation and analysis in relation to the full range of issues in the project continued.

During the last phase of the project, to be concluded by the end of 1993, the focus will be to synthesize the many different insights accumulated during the project, to identify patterns and priorities in these insights, and to find effective ways to accumulate and disseminate the insights. Thus considerable care will be taken to present the recommendations that are to be the final product of the project in effective ways. Different sorts of summary documents for different sorts of audiences will be made available.

Running the Project

The scope of this paper is rather moderate because of its length, but also because the project will reach its final phase by the end of this year, which means that we will be able to present the main outcome of the project at the TelEd conference, but not in this paper. To give you an idea of what has been going on so far, we will briefly describe some experiences in the project.

As with many other activities, it is very important to establish a good multi-disciplinary team to handle the complexity of a project in the field of educational telecommunications. Using telecommunications as an educational tool creates a far more complex situation than we experienced before in the school. The actors in telecommunications use are the teachers themselves, but also the telecommunication industry, the network developers, the on-line database providers, and the software industry (De Vries & Collis, 1993, p. 915). Most likely an individual teacher will not ever have to deal with this conglomeration of actors, but a project team will. Therefore we choose to have a team with experience in the field of telecommunications (communication and information systems, databases, hard- and software; University of Leiden), teacher training and support (Utrecht University), and research (University of Twente), all with a long years' experience in educational telecommunications. Very important as well is the selection of schools and teachers. Since the major task of the project team is to deliver a practical set of recommendations for a communication and information system to be widely used, the importance of the selection was quite obvious. Therefore we choose to work with institutions that represent the "mainstream". A selected number of schools were asked to participate. As became clear, only the schools receptive to innovative activities were interested. This was underlined by the various reactions of the teachers, school management, and others involved, on the question asked at the start of the project: "What will make this project successful in the context of your schoolwork?" Teacher: "I am satisfied when the project keeps me up to date with new educational developments." School management: "If this project stimulates a broader use of computers by my team of teachers, then the project is successful." Project partners clearly have different goals within the framework of a common project. Therefore, it was important to clarify right at the beginning what expectations the project team had in the collaboration with the schools, and put this information in an official agreement. Involved in the project are four middle-level vocational institutions with two teachers from each school working in the subject areas "economics" and "tourism."

Getting started

Telecommunications use in an educational setting is seriously troubled by the so-called first-level problems, such as unavailable or unusable equipment. No telecommunications use occurs when these problems are not solved. However, once these "first-level" problems are eliminated, "second-level" problems arise. Second-level problems are those which relate to human and instrumentation issues (Collis & De Vries, 1991). Effective use of telecommunications depends largely on the pedagogical and organizational insight of the teacher involved and the necessary instructional skills for computer use in connection with telecommunications (Veen, 1993). To be able to avoid the first-level problems, the teachers were supplied at no cost, both at home and at school, with the necessary equipment (computer, modem, and printer), and an additional telephone line with a maximum of monthly communication costs of *f*150,00 ($80). Part of this starter package was the data communication software and a subscription to Campus2000, an English educational network, run by British Telecom, and Viditel, a Dutch public communication and information service of the national telephone company. In general, the instrumentation of the use of telecommunications, in particular the communication software, gets very little attention. The software used in this project, named Teleline (De Vries & Collis, 1993), was specially-developed for convenient on-line work, with interesting didactical options. In addition the software was tailored to systematically capture the teachers' and students' on-line experiences as part of the strategies to collect valuable information for research.

Teacher training and support

One of the specific focuses of the CISO Project is the development of strategies for teacher inservice and support relative to the use of on-line systems for professional and lesson-related activities. As part of "getting ready" in the first phase of the project, attention was given to the human and instrumentation issues which cause the second-level problems referred to above. Our strategy was to supply the teachers with the necessary familiarization in the use of soft- and hardware, national and international databases, and the electronic help desk, and to discuss the pedagogical, educational, and organizational consequences for their classroom practice. The inservice training started with four weekly sessions of three hours each on the familiarization with the hard- and software and the databases. The fourth session focused on the criteria for the use of telecommunications in classroom-related activities. Each session was supported by a discussion of "homework." These assignments were particular important for the stimulation of the teachers' commitment to the project. Especially at the start of a project it is valuable for the participants to exchange ideas, ask questions, and get to know each other. During this initial part of the training, special attention was given to the electronic help-desk as part of the ongoing support for the teachers. This videotex-based system was developed for communication and information exchange between all participants, with an agenda, news, up-to-date information on interesting and/or new electronic services, etc. Clearly, one had to get familiar in using the system. But as the project progresses, teachers find themselves using this system more often, because it is so convenient to read and send mail where and whenever you want, to be able to read a meeting report the next day, etc. Interesting enough, teachers consider the communication option as very valuable in their contact with other project members and think that this option could solve major problems in their school setting too (Veen & Vogelzang, 1992). Part of the ongoing reconstruction of the school system in The Netherlands is the integration of schools in large organizational entities with a many different buildings located all over the city. This arrangement causes major communication problems for managers and teachers working at different places. The second part of the training consisted of four monthly sessions of three hours in preparation of classwork. Important issues were

- developing a lesson plan
- lesson preparation
- presentation and exchange of ideas and lesson material
- planning of classroom activities

In this period, three generally applicable lesson modules have been developed in collaboration with the teachers. One module is on "getting to know telecommunications," another on "using an on-line information service," and a final module on "the development of information handling skills." During the last phase of the project, until the end of this year, the teachers will concentrate on the classroom related activities and use these general modules along with lesson materials specially developed to fit in their curriculum-related lesson plan.

A few highlights

Although no final conclusions can be drawn yet, there are a few interesting points to make. First, the teachers' experiences have shown that none of the teachers appreciated the use of foreign databases offered through Campus 2000. Databases were difficult to access, each of them with a different command structure. The information offered in Campus2000 was, in the view of these teachers, not applicable for Dutch schools. As far as the Dutch public databases are concerned, the tourism teachers were much more enthusiastic about the content of the databases than were the economics teachers. Apparently, the subject area of tourism is better covered by the information services than economics. The teachers' view of the use of telecommunications in education is developing. Interestingly, the teachers especially appreciate the services for communication (electronic mail) and for information retrieval during their lesson preparation. Thus these teachers think that a communication and information system for education would fit their need for professionalization. The use of telecommunications in the classroom relates according to the teachers' view to (1) telecommunications as a subject, and (2) telecommunications as a rich educational tool. In order to prepare their students for future jobs, the teachers want students to know how to deal with on-line electronic databases and how to communicate. On the other hand, they are convinced that in particular matters students should acquire information not only in books and other printed matters but in up-to-date information systems as well. The school principals and system operators have expressed their view on the use of telecommunications with respect to the internal communication among the different annexes of the school located at different sites. This situation is the result of restructuring the Dutch school system into large organizational entities, causing major communication problems. They see that telecommunications could supply a solution to these problems. Clearly the project has stimulated all participants to rethink the priorities to be set for using telecommunications in education. So far, it seems that the need for telecommunications is especially urgent at the professional level.

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Cluster Session (F46C)

The Use of Telecommunication in Education and Distance Education (LEARN) in Inservice Training in Denmark

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Keywords: classroom practice, communication, electronic mail interdisciplinary, flexible learning, methodologies

Abstract

In the telematics project Schools in Network much emphasis in the collaborative projects is put on: class-to-class/student-to-student collaboration -- well-structured telematics projects based on the syllabuses in the respective subjects involved — annual teachers' conferences at which projects are evaluated and designed. Teachers are offered an inservice distance education course in how to integrate the use of information technology and how to structure telematics projects in education.

International Cooperation

There has always been considerable interest in the Danish educational world in international topics. The interest is even more distinct now because of Denmark's membership of the EEC, since it is now natural to focus not only on Europe as an area of interest but also on the rest of the world. This growing international interest combined with similar pedagogical ideas on how to implement the use of telecommunications in education made it natural for the project Schools in Network some years ago to start a cooperation with the European Schools Project — a very successful cooperation.

The Danish Folkeskole

The number of Danish schools that have joined the project has grown considerably the past years. The reason for this are not only the growing interest in working on international topics, but also two other factors: (1) The flexible working environment in the Danish primary and lower secondary education system, or the Danish Folkeskole; (2) The recommendations given by the Danish educational authorities in supplements to already existing curriculum guidelines on how to integrate information technology in education and how to use telecommunication.

Preconditions for a Successful Cooperation

Too many teachers experience the failure of a telematics project they have been engaged in, most often because of missing or inadequate preparation. Some preconditions are fundamental for good telecommunication projects: (1) Teachers involved should consider when, how, and why they want to participate in a telematics project. (2) It is important that a team of interested teachers start a project and that they concentrate the work on a single class or form level. (3) It is a good investment to spend considerable time planning the project with the foreign peers. (4) Pupils should not be engaged in a project before agreements have been made on the time allocated for and the contents of the project. (5) Agreed schedules should be observed. (6) When working with foreign schools' allowance should be made for other school traditions and educational philosophy. The flexibility of systems, contents of the curriculum, the freedom of teachers' methods vary from country to country. These differences in the educational systems are a challenge, a challenge to awaken the consciousness of differences and similarities.

Telematics Projects

It is a well-known fact that it is important for children to have a real audience for their writing. That somebody is reading, reflecting on, and reacting to what they have produced. By providing a real audience, and only by creating meaningful projects, E-mail has a role to play. Audience and purpose go hand in hand with communication. A wide range of successful telematics projects have been carried out over the years. In foreign languages the younger students have predominantly concentrated on topics related to the local environment. Older students have been engaged in topics such as "Endangered Species," "Juvenile Delinquency," "Memories of World War II," or "Young in the 30s – Old in the 90s." The last topic received the ISTE prize for a good telematics project in 1991. A mathematics project "Statistics in Everyday Life," involved students from several countries. The physics project, "Energy," focused on the problem of power production in various European countries. In the "Acid Rain" and the "Aquadata" projects special interest was put into investigating and comparing air and water pollution in several European countries.

Annual Teacher Conferences

In order to strengthen and extend the cooperation between the participating teachers annual conferences are held where the sequence of the completed projects are evaluated and the design and planning of future cooperation projects are made. The participating countries alternate to host the conference.

Evaluation

Many of the mentioned projects need close cooperation between different subject areas. Consequently there has been a growing interest for working in an interdisciplinary fashion. Students and teachers participating in the telematics projects experience not only how much we can learn from each other, and how dependent we are on each other, but also how important it is to understand who they are and which society they are part of. It is not only the surrounding world, the others, who are a resource of learning. They are so themselves, and they feel that they themselves, their knowledge, and experience are of value for others. Furthermore many telematics projects have proved to have a positive effect on the quality of communicative foreign language use and to increase intercultural consciousness.

Inservice Training

In order to meet the growing demand for inservice courses in the use of telecommunication, the Royal Danish School of Educational Studies offers distance education courses with the aim of giving teachers an insight into the implementation of information technology in general and the preparation of telematics projects.

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Cluster Session (F47A)

Using Telecommunications to Facilitate Interlibrary Loan and Resource Sharing in K-12 School Libraries

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Keywords: library, training, interlibrary, loan, cooperative, New York, TNT

Abstract

This session will describe how cooperation between a school library system and a regional information center facilitated interlibrary loan among 113 K-12 school libraries in Central New York State. It will detail how telecommunications technology expanded access to resources outside of an individual school library's collection. The central focus of this session will be on the effectiveness of a standard "electronic mail" form to drastically reduce the time between a student-teacher request for and the actual delivery of print material. The presenters will outline how the form was created, how the planning process and pilot phase were conducted, how policies and procedures were formulated, and how training times and user group meetings were scheduled. It was the goal of the project coordinators to train library media specialists who can act as telecommunications trainers and facilitators within every school building in the Central New York region. Special attention will be given to the idea that the efficiency of using electronic mail forms attracted even the most reluctant telecommunications users to seek the offered training.

Also discussed will be the use of Bitnet, listservs such as LM NET, an evolving New York State network called Technology Network Ties (TNT), and increased resource utilization through the cooperative use of telecommunications and training.

The timeline

This project commenced during the spring of 1991 and was ongoing throughout the 1991-92 school year. During the summer of 1992 it was refined, with specific training dates set up for the 1992-93 school year. It continued with additional training and added Internet access during the spring and summer of 1993, and continues with specific training dates and procedures for new users throughout the 1993-94 school year.

Spring and Summer 1991

During the spring of 1991, two leaders in the Central New York region came together to experiment with an emerging capability on the new Technology Network Ties (TNT) wide area network that connected twelve major mainframes across the State of New York. This capability was the use of the PROFS electronic mail package to deliver electronic mail and, more important, electronic mail FORMS. The FORMS function had not previously been implemented, and the two parties decided to implement an "Interlibrary Loan Form" as an attempt to demonstrate the efficiency of electronic mail to librarians throughout 23 Central New York school districts.

Judy Jerome, the director of the Onondaga-Cortland-Madison (OCM) School Library System, had been working with Dan Lake, a consultant within the Central New York Regional Information Center's Learning Technologies Department. Together, they had experimented with uses for early bulletin board systems (BBS's) to create efficient methods for communications among numerous libraries.

In February and March of 1991, Sandy Baker, an intern from the Syracuse University School of Information Studies, was assigned to the OCM School Library System. Dan and Judy decided to work with Sandy to institute a pilot project to attempt to use electronic mail for interlibrary loan requests. Judy investigated her "member plan" reports to determine which libraries had phone access, computers, and, perhaps, modems. She then cross-referenced her findings with those librarians who were frequent users of the interlibrary loan service. She contacted all librarians in the region who might make use of the new network capabilities. All were invited to a summer "steering committee" meeting to formulate a plan for using electronic means to replace a paper interlibrary loan form. The goal was to reduce the turnaround time from a request for material to fulfillment of the request.

The summer session(s) resulted in a core group of about thirty librarians who agreed to learn to send and receive electronic mail — and the forms. Daily mail checking was made a part of an emerging policy statement. A first draft of a form was extrapolated from the paper form already in use within the region.

Fall 1991

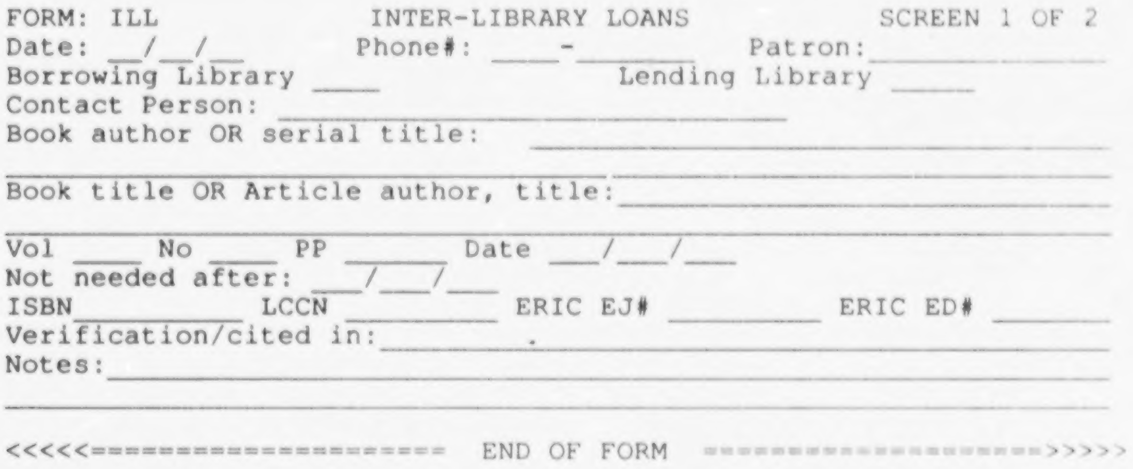
The first phase of the project commenced in the spring with numerous site visits by Dan Lake and the Syracuse University intern to assist each site with access to the TNT network dial-in ports. This process continued throughout the fall. Several leased lines were placed in outlying districts to enable all participants to reach the mail storage site with no added long distance charges. Since these same lines were positioned as part of the administrative services already purchased by districts, the charges were considered "value added" and subsumed under administrative budgets. The participants were supported with Macintosh copies of "Microphone" — an early version that was donated upon request by the manufacturer. Also, fifty copies of the Apple IIE product ReadyLink were purchased at a special high-volume price for those having access to

Apple 11 Computers. FTTERM software was provided to IBM users. Wherever possible, support was given to those who owned other software that would accept the parameters required by the host.

Spring 1992

During the spring of 1992, the participants' number increased to fifty librarians due to training and setup help. Demonstrations of the form and the uses of basic E-mail continued during library meetings and microcomputer support meetings. A meeting in late April 1992 resulted in two recommendations: change the form to fit, with header, upon one screen, and set a regular schedule of training required for the assignment of new accounts. Throughout this phase, attempts were made to expand the concept of electronic access and to create cooperative attitudes among library staff and "computer coordinators." Emerging LAN system operators began to be included in the idea of a total connection among administrative personnel, instructional support personnel, and direct instructional staff. In many cases, the LAN support began to fall under the aegis of library staff, because of their experience with electronic mail and their development of library automation projects.

Figure 1: The finalized Interlibrary Loan Form in Use Today



```
FORM: ILL              INTER-LIBRARY LOANS              SCREEN 1 OF 2
Date: __/__/__         Phone#: ____-________        Patron:______________
Borrowing Library ____                    Lending Library _____
Contact Person: _____________________________
Book author OR serial title:     ___________________________________
_______________________________________________________________________
Book title OR Article author, title:__________________________________
_______________________________________________________________________
Vol ____ No ____  PP ______  Date ___/___/___
Not needed after: ___/___/___
ISBN__________  LCCN __________  ERIC EJ# __________  ERIC ED# _______
Verification/cited in:_________________________________________________
Notes:_________________________________________________________________
_______________________________________________________________________

<<<<<==================== END OF FORM ====================>>>>>
```

Summer 1992

During the summer of 1992, the steering group met to create the new form that would fit on one screen, eliminating the awkwardness of the previous form's need for pagination each time it was used. This was accomplished with about thirty minutes' help from a system programmer. Added at the same time was a command that would automatically route an acknowledgment back to the sender when a sent form was opened by the recipient (Figure 1). Procedures for checking and responding to requests were written, and four yearly training dates were set for the establishment of new librarian-users. A policy statement was issued as well as a "reminder" sheet to be sure that each participant checked mail each day. Plans were made to report progress to several statewide technology and library organizations, emphasizing the need for cooperative activities.

At this time about twenty pilot accounts giving "gateway" access to Internet were parceled out to the library project participants.

Preliminary training regarding Telnet and FTP software was given to those wishing to take part in the pilot. Several librarians were given extra training so as to become trainers for the total population of teachers and librarians in the region. Dan Lake gradually shifted the training from the general microcomputer support to the school library system. The new trainers became available for the educational system as a whole, but to the library staff in particular.

Fall 1992 and Spring 1993

By this time, the program had increased to 56 library sites of the 113 eligible. The participants were exposed to resources available via an Internet gateway established in Albany, New York, in partnership with NYSERNET, a Northeast provider of Internet access. After December 1993, "Gopher" software became available at the New York State Education Department, and training was begun with librarians who showed an interest in using the "Gopher" software. Most activity still took place from personal computers linked via dialup access to the regional host mainframe, though some was beginning to be incorporated into new Local Area Networks wired directly to the host at the CNYRIC. A major issue became the downloading of files, since users with Apple IIes could not do this and Mac users were very limited due to protocol problems. The regional information center staff began to explore a more direct partnership with WSERNET.

From January 1993 to June 1993, 420 educators were given accounts for electronic mail access. Of those, 150 were also given Internet access. Training with Gopher software continued from May through August, with librarians being the target audience. The goal was to develop librarians as the primary support personnel, but to offer teacher training also, beginning to develop training methods to impact direct classroom instruction.

The Present

The interlibrary loan program continues, with one fall, one winter, and one spring date set for training. Two new libraries have come "on-line" since August. In addition, two librarians have become expert trainers to the region, supplying training to over fifty educators during May through August. They will continue to offer two levels of training: 2 two-hour classes to move from beginning electronic mail to Bitnet Listserv uses; and 4 two-hour sessions moving from beginning electronic mail skills to Gopher uses and FTP downloads. Thus, the original "interlibrary loan" project has now impacted more than 60 percent of the buildings in the region, and has begun to affect the general teaching population. It is the ultimate goal now not only to increase efficiency and quantity of sharing via the interlibrary loan form, but to also provide at least one Internet-knowldgeable support person in every building in the region. At the same time, the CNYRIC is in the process of creating a direct partnership with NYSERNET to provide a more user-friendly mechanism for moving documentation from a host to a PC.

The Outcomes

To date, the outcomes have been impressive: a large number of trained staff; more efficient exchange of shared material; more informed and cooperative planning regarding total electronic environments in schools; training procedures for librarians, teachers, and students; a two-day training session for electronic project development; numerous local articles about student outcomes resulting from teachers, using the resources; movement toward the "Electronic Doorway" concept; and, perhaps most important, a model for cooperative activity that joins technology trainers and library support personnel.

Cluster Session (F47B)

The Library without Walls: Using Telecommunications to Teach Information Literacy

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Keywords: information literacy, libraries, distance education

Abstract

Freely accessible networked information sources have created "libraries without walls" whose users may be located on-site or spread across continents. Designing a user education for such diverse populations creates a special challenge for academic libraries. Penn State University is responding to this challenge by designing a distance education course that emphasizes the critical analysis, as well as the electronic access, of information.

Networked information sources, such as those available on the Internet, have permanently changed the way library users access information. Once a centralized, location-bound process, information gathering has become an autonomous activity whose boundaries are limited only by a user's resources and creativity. A by-product of this development is the "library without walls," whose users may be located on-site or scattered across continents. The unique character of the "library without walls" poses special challenges to academic libraries, where instructional experiences have traditionally been based on personal encounters with users. How can an institution design a user education program that instructs remote users in efficient use of the resources of the host institution while simultaneously encouraging its resident users to effectively explore the unfamiliar information sources of other institutions?

Penn State University is responding to this challenge by designing a distance education course available to PSU and non-PSU-affiliated students that develops skills in accessing and evaluating information. Jointly developed by the University Libraries, the Center for Academic Computing, and the Office of Undergraduate Information and Communication, this course uses a combination of printed lessons, networked information sources, and electronic mail and conferencing systems to explore information published in print and electronic form. The curriculum is divided into three units: (1) "Information and Communication: Creating a Technological Revolution," which introduces the concept of information as a form of communication and discusses traditional as well as electronic solutions to the technological problems of communicating data; (2) "Exploring Electronic Information" which uses LIAS (the libraries' gateway information system) and Penn State's Gopher to explore a variety of local, national, and international electronic information sources. This unit also emphasizes the use of electronic mail messages and discussion groups to promote interactive, border-free communication environments; (3) "Responsible Information Consumption," which fosters the efficient and ethical use of information by developing a framework for critically evaluating information quality. An awareness of the ethical implications of electronic information access is also developed by discussing such questions as "Who creates information?" "How much does information cost? "What are the responsibilities of an information consumer?" and "What is the cost of misinformation?"

Underlying this curriculum is a belief that electronic libraries demand users who can identify information and assess its content. Complementing this goal is a hope that critical information consumers will appreciate the opportunity that telecommunication affords for encouraging global information exchange. To this end, the curriculum stresses interactive dialog in the form of class-focused as well as internationally based electronic discussion groups. Students will be encouraged to discuss assignments electronically with each other as well as with the instructors and to participate in one or two discussion groups of interest. Students will also have the option of electronically submitting their assignments and receiving evaluations.

Cluster Session (F47C)

EELink: An EE Resource on the Internet

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Keywords: environmental education, Internet, resources, Gopher

Abstract

NCEET's EELink helps guide K-12 teachers to useful environmental education materials that exist throughout the Internet. EELink also serves as an outlet for materials collected and produced by the National Consortium for Environmental Education and Training (NCEET). These include the Environmental Education (EE) Toolbox, a resource for teacher trainers, and Success Stories, a positive approach to teaching environmental problem solving. All NCEET materials, like all resources on EELink, are provided free of charge.

EELink is an on-line, computer-mediated service to distribute documents and electronic data to educators interested in environmental education. EELink was conceived to be a single location on the Internet that users could access for information collected and produced by the National Consortium for Environmental Education and Training (NCEET), as well as many other services and documents available on the Internet that might be of interest to environmental educators.

EELink is:

1. A computer and software
2. A collection of NCEET generated materials
3. A collection of materials provided to NCEET by others
4. A "gateway" to other resources on the Internet that may be of value to environmental educators.

Materials available on EELink generated by NCEET staff include the EE Toolbox as the Success Story collection. The Toolbox is designed primarily for people offering continuing education workshops for teachers, although it also contains useful resources for teachers. Its centerpiece is a teacher trainer manual, which contains orientation materials for those who are new to environmental education and ideas for expanding existing programs to reach new audiences. These include strategies for teaching environmental education through the humanities, arts, and social sciences and a focus on meeting the needs of urban, rural, and multicultural audiences.

Other Toolbox components include the EE Directory, a resource for teachers who are developing EE programs in their classroom or school, a database of EE resources, selections of EE literature, and sample classroom activities. NCEET's Success Stories will expose students to the experiences of everyday people who have successfully met environmental challenges in their own back yard. By emphasizing what can be done, NCEET hopes to counteract the gloom and doom that often surrounds discussions of environmental problems. EELink users will have access to the Success Story archive, a collection of stories taken from books, newspaper articles, and personal interviews with environmental problem-solvers.

As a complement to the archive, the Success Story Primer will help teachers develop techniques that put students in the shoes of success story subjects. Students can then learn different approaches to environmental problem solving and find ways of taking action themselves.

The EE Toolbox and Success Stories collection are not the only materials NCEET has prepared that are on EELink. A list of upcoming conferences and meetings is available, as are several collections of resources, including names and addresses of many organizations, sources of curriculum and curriculum reviews, and a variety of other resources.

In addition to the materials generated by NCEET, EELink offers links to many gophers and other services and datasets available on the Internet. If you are presently an Internet user whose computer is hard-wired to the Internet, you should obtain a Gopher Client for your computer. This program will allow you to use many of the features of your own computer to obtain information from EELink in the most efficient manner.

Once you have a client, aim it at EELink using the address nceet.snre.umich.edu 70.

If you use dialup access to Internet through a local university or other service, there may be a client on that machine. The normal command to run the Gopher Client and connect to EELink would be: gopher nceet.snre.umich.edu 70. If your Internet access does not provide a Gopher Client, NCEET has set up a publicly available Gopher Client. To access it, sign on to your Internet account and give the command telnet nceet.snre.umich.edu

Then login as "eelink."

If you don't have access to your own Internet account, you can access EELink by placing a call to one of our numbers in Michigan. Set your communications software to emulate a vt100 terminal. Use your modem to call one of the following numbers:

(313) 763-6520 1200 baud
(313) 764-4800 2400 baud
(313) 747-3400 9600 v.32

(313) 763-6800 19200 v.32 bis

Wait several seconds after the call is answered and then press RETURN twice.

At "terminal=" type:	vt100 <cr>
At "Which Host?" type:	um-eelink <cr>
At the "login:" type:	eelink <cr>

After you sign on, the EELink Main Menu will be displayed. Type the number of the item you wish, or use the up and down arrows to select the item and press RETURN. After you view a document you will be prompted to mail it to an E-mail address or download to your own computer. To perform a protocol transfer, go to the desired EELink document.

When you are asked to mail it or download it, enter D. EELink will then let you select a protocol and wait for you to activate the file transfer option in your software. When the transfer is complete, an EELink menu will reappear. EELink isn't just a machine. It is maintained by people who would like to hear your questions, comments, or suggestions. When you log off, you will be asked if you would like to leave a message for NCEET. The EELink system administrator reads messages each weekday morning and will respond to you through E-mail or regular mail. Just leave an address.

Poster Session (F4A)

Teachers Electronically eXcited and Sharing (TEXAS): Christa McAuliffe Telecommunications Project

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Abstract

Originally the Teachers Electronically eXcited and Sharing (TEXAS) project involved students in learning about their communities and relating what they learned to economic development issues of the world economy.

Conceptualized during the 1991 Stanford/Christa McAuliffe Institute experience and sponsored by the National Foundation for the Improvement of Education, the TEXAS project is now a multidistrict, multiage, multidisciplinary gathering of TENET-using teachers.

Context

Important products of the project include the student-written portraits of the special elements in the community and sharing of those portraits on-line with students from other schools. Groups collect data, create databases of information, and analyze data stored about elements studied in the community. Each participating campus may choose to telepublish a newsletter or news magazine with appropriate articles shared in the electronic conferencing area of the Texas Education Network.

More than sixty teachers represent most school districts in Southeast Texas. They are learning to bridge curriculum and technology using telecomputing as a forum for collaboration while incorporating multimedia to focus on changing models for both classroom and staff development learning. The TEXAS teachers share their successes and frustrations at monthly curriculum support meetings. In addition, special technical "how-to" sessions are provided in cooperation with the Region V Education Service Center as the group progresses.

The Texas Education Network and the Internet are avenues for communication which will be demonstrated by these educators. With a major emphasis on curriculum project development, the TEXAS project provides examples and models for all who participate. Truly a community of learners, these teachers connect to each other and discuss ideas for weaving curriculum objectives into on-line projects.

Interpersonal skills, team building, and coalition building are all necessary components — along with telecommunications — to help us collaborate and connect to our changing society and our changing classrooms.

Poster Session (F4B)

California Meets Lower Saxony

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Keywords: telecommunications, E-mail project, foreign language, German, high school

Abstract

Earlier this year, high school teachers of German in several California Bay Area schools came together to participate in a telecommunications project in which they and their students were in touch with their counterparts in Lower Saxony, Germany. The teachers — many of whom had no computer or telecommunications background — learned the intricacies of the CORE system, and experienced some of the highs and lows of communicating across the world via E-mail. The project, sponsored by the Goethe-Institut of San Francisco, began with teachers, meeting face to face to learn about the CORE system and to plan for the exchanges. Later in the spring, Reinhard Donath, the coordinator of the project from the German side, visited California, met with the teachers, and came to some of their classrooms. He reinforced what they had already learned regarding the value of the exchange for teachers and students alike. Although there were some difficulties with the E-mail process because of the occasional vagaries of the workings of the Internet, the enthusiasm generated on both sides of the Atlantic was exciting. Students felt they were learning much more than a foreign language, since the language was firmly placed within the context of an existing culture. Teachers found their students were more interested in perfecting their language skills so that clear communication with their peers could take place.

Poster Session (F4C)

Cooperation between Educational Tele-Organizations in The Netherlands

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Keywords: cooperation, developments, Netherlands, Europe, PETTO

Abstract

*The years 1992 and 1993 for 8,000 primary and 800 secondary schools in The Netherlands have seen rapid introduction of new telecommunications activities and projects. In 1993 three on-line educational software databases and twelve bulletin board systems (BBS) exist. Three international networks (I*EARN, Computer Pals, WorldClassRoom) have representatives coordinating school projects. The 150-school network European Schools Project is Dutch-based.*

In a report (Collis, 1991) on the state and quality and educational impact of telecommunications, the following weaknesses are detected. Of forty telecomprojects, the majority are run by only one or two "pioneers." Most of the projects deal only with communications, not with database use. There is no systematic assessment of educational effects, and there is little or no exchange, linking, or cooperation between projects.

The last major conference on "educational telematics," initiated by the Ministry of Education, took place in January 1991. Unfortunately a Ministry Committee on New Media was discontinued in February of that same year.

Platform

In February of 1992 initiatives were taken by nine "tele-organizations" (BBSs, on-line databases and networks using electronic mail) to establish a Platform for Educational Applications of Telematics in Education (acronym in Dutch: PETTO), meeting two times a year and publishing a quarterly newsletter.

The aim was to increase professional exchange, stimulate publication and cooperation between projects, focusing on organizational and educational, not technical issues. In October 1993 participants from fifteen organizations attended the fourth meeting, representing primary and secondary schools, teacher training colleges, school support and curriculum development institutes, universities, and nonprofit computer organizations.

Developments

The content of the meetings reflects the state of affairs and the developments of the last two years:

- History and background of participating organizations
- Examples of projects, information, and messages
- User statistics and ways of use by students, teachers, and schools
- Tasks and time investment of sysops and project coordinators
- Regional and national linking — electronically and organizationally
- Internationalization, linking with Flanders (Dutch-speaking Belgium)
- The position of telecommunications within an educational "Media Mix Plus" (meetings, TV broadcasts, magazines)
- One BBS versus a network of linked BBSs
- Training materials and issues
- Telecommunications and curriculum
- Ethics and on-line etiquette

References

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Poster Session (F4D)
An Online Stylebook

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Keywords: on-line, text, style, format

Abstract

We love on-line communication because it is fast and convenient. However, if the received material is difficult to read or share, we might as well have used the mail.

Simple style and formatting principles can create readable, understandable, and visually pleasing screen-read documents. By treating the monitor as a virtual page, authors can develop a "journalistic" style of on-line writing that enables readers to move from screen to screen without overlooking key information. The monitor becomes a special case of desktop publishing, and on-line editors can adapt familiar design elements from

paper-based text, including use of white space, visual center, and proportion of type size to line length.

Another challenge in on-line communication is ensuring that the format survives the journey. The screen appearance of E-mail text is only one issue. The on-line audience often "consumes" telecommunications as databases, print publication, or other media. They may need to quickly forward communications to others. Common conversion software, such as the Macintosh program BinHex, *allows authors to share on-line files between applications. Simple procedures for preparing uploads allow messages to pass easily through different E-mail systems.*

Key to these techniques, as with all communications, is understanding the audience. A useful planning tool for telecommunications work is a checklist of the needs and capabilities of the people and equipment at the other end of the line.

Panel Session (F51)

Telecommunications and Ethics Panel

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Bill Hunter
Connie Stout, Texas Education Agency
Daniel Weitzner, Electronic Frontier Foundation

Although microcomputers have been in classrooms for at least a decade and we have witnessed marvelous gains in the power of computers and the quality of instructional software, relatively few gains have been made in our understanding of the ethical use of computers and information. Increased access to information resources in electronic form has created a host of new ethical problems and has changed the context in which a number of ethical issues arise. For example, although most educators and students understand well the concept of tangible property ownership and *rights,* such concepts are not well understood as they apply to electronic information resources. The following are some of the views that are still expressed by teachers, students, and parents:

- It is acceptable to make multiple copies of a software program as long as the copies are used for teaching purposes.
- It is permissible for another teacher to make a copy of software that I purchased.
- If a software program is not copy-protected, the publisher doesn't care if you copy it.

The rapid increase in the use of computer-mediated communications now provides even greater challenges to schools in developing ethical student behaviors in the use of these new technological tools and resources. Law enforcement officials have noted an alarming trend in which young people start by hacking into systems and eventually become serious offenders with computers. They note that these offenders adhere to their own ethical standards and hold unconventional beliefs about computers and information. Some of their basic tenets are as follows:

- Data are free and should be accessible by anyone.
- Data should never be destroyed but there is nothing wrong with viewing and transferring data for one's own use.
- High school students who place viruses into computer systems are innocent pranksters and do little harm.
- Hackers who break into computer systems should be respected because they test the soundness of the system and reveal its holes and weaknesses.
- If someone does break into a system, the school or corporation is at fault for failing to adequately safeguard its computer files.

Contributing to this problem is the lack of awareness of these issues by many educators and the lack of information and materials to assist teachers and students in understanding the ethics of use of the new telecommunications technologies.

This panel brings together a group of experts concerned with the ethical use of the new information and communications technologies. The panelists will share their views of current telecommunications ethical problems such as confidentiality and privacy, consequences of destroying others' information (viruses and worms), plagiarism and giving credit, electronically stored information-nation and multimedia as property, telecommunications courtesy and ethics, free speech versus school responsibility, etc. The panel will also offer recommendations for ways educators may help students develop ethical and responsible use of telecommunications in education.

Cluster Session (F53A)

The Cerritos Video-On-Demand Educational System

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Keywords: broadband network, remote access, shared resources

Abstract

The Cerritos Video-On-Demand Educational System enhances the classroom learning environment by allowing educators to tap into a wealth of shared resources.

A broadband educational network developed by GTE provides classrooms in Cerritos, California, with remote access to video, audio, and data. The network, the Cerritos Video-On-Demand (VOD) Educational System, allows teachers and students to access this information via the advanced capabilities of their local telephone company. The information can take the form of video conferences with other classrooms in a second school miles away, interactive programs from a large shared video library, or interactive live broadcasts from specialists that are normally unavailable at the school. Video and audio provided through the system can be presented on wall-mounted monitors for group presentations and/or as a window on a classroom workstation for individual instruction. System services include video-on-demand, short-notice video library programming, video broadcasts, video-conferencing, and video slide shows. Most services offered through the system can be accessed via a special remote control and a standard television receiver. In addition, advanced services can be accessed with a computer workstation located in the classroom. The VOD system connects the classroom workstation to a remote library of software applications as well as to the remote video library. With access to the remote software and video libraries, the classroom workstation supports level 3 interactive laser disc applications. The system creates a classroom environment where teachers and students can, at a moment's notice, view text, graphics, data, and video, as well as listen to audio from shared resources, all at the touch of a button.

The VOD system successfully integrates the capabilities of the telephone companies, switched network with interactive educational technologies to enhance the learning environment in the classroom. Despite the wide array of modern technology used throughout the VOD system, from fiber optics to broadband switching to information storage and retrieval devices, the classroom interface is very simple. This simple interface, a remote control and a television in conjunction with an interactive menu, provides a means for teachers to access and present a wide variety of information with minimal effort. The teacher is no longer concerned with maintaining high-technology equipment, acquiring and assembling resources, or planning months in advance for availability of source material. The system is responsible for making resources and source material available. Teachers and their school systems are concerned only with what information they need and how this information can be used to enhance their lessons.

Cluster Session (F53B)
Fewer Dollars versus More Service

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Keywords: fiber, telephone, video, network

Abstract

The Des Moines Public Schools, faced with increased demand for telecommunications service and fewer dollars available to provide them, embarked on a program of providing a telephone in every classroom, data networking to 63 locations and a fiber-optic, two-way video system for distance learning. Using in-house personnel, systems were implemented. Current expenditures are less than the amount that was spent for telephone service alone in 1988.

Need for Improved Service

In the late 1980's, shortcomings in telecommunications and data services were hindering the Des Moines Public Schools in performance of their mission of teaching and learning. Vastly improved telecommunications and data services were needed for the 63 locations.

The telephone systems were of late 1950's design, and few phones were available for teachers needing to contact parents. Data processing was available on-line from within the administrative offices, but only in batch mode only the buildings. Administrators were unable to get timely information for management. Teachers were unable to access test results to make timely instructional decisions.

At the same time that telecommunications needs were being identified, the district was receiving less state aid as a result of declining enrollment and general economic conditions. There were also several across-the-board cuts in state aid made after the budget year had already begun. In this circumstance, the decision was made to vastly upgrade telecommunications services while holding costs down.

Critical Decisions

In the late 1980's, the district made a number of critical decisions designed to vastly improve service and at the same time control costs:

1. Use district personnel to install and maintain all systems.

2. Provide a telephone in every classroom in the district.
3. Install a fiber-optic network between large buildings.
4. Utilize two-way video to provide instruction in low-enrollment classes.

Implementation

In 1986 a ROLM telephone system was installed in the administrative offices of the district. The equipment, which replaced a system installed in 1958, provided telephones for the administrative offices, and also a phone for every classroom at one high school. The system was purchased with enough spare capacity to provide phone service to three other large buildings. Technical personnel were hired and factory-trained to maintain the system. They were also used to make telephone moves, adds and changes, resulting in a significant savings as well as quicker response for service. Installation of district-owned telephone equipment and utilization of district staff has resulted in a savings to the district in excess of $400,000 over a seven-year period.

The phones in classrooms were well received, and significant improvements in staff morale, parent involvement, and school climate were noted. In 1987 the district embarked on a phased program to place a phone in every classroom in the district. Personnel were hired to install and maintain integrated telephone, public address, and data distribution systems. As each building is wired for telephones, cabling is also installed to support future networking to the classroom. Improved service rather than cost savings was the purpose of placing telephones in classrooms. But, since there are no lease or maintenance fees, operating costs for new systems, even with additional lines to support the additional phones, are almost identical to operating costs for the old systems.

On-line data connections to the district's mainframe were also installed in all 63 buildings. The system provides student accounting, lunch room accounting, student progress records, facility maintenance records, and financial accounting for the district. US West, the local telephone company, provided leased data lines to those buildings not served by fiber-optic cable. All installation and maintenance of the equipment were performed by district technicians.

Connections between buildings are a significant annual expense. The opportunity to link major sites by fiber-optic cable presented itself in 1987. The fiber, owned by the local power company, is leased to the district. The lease arrangement allows the district access to the virtually unlimited capacity of the fiber. Equipment currently in use provides up to 12 DS-3s (336 T-1s) on high-traffic portions of the network and can be expanded beyond that if necessary. Using fiber service for voice and data services has resulted in a savings of over $400,000 in an eight-year period.

Also in 1987, the district began using two-way video for instruction. The district is now using full-motion DS-3 digital video to offer low-enrollment classes between high schools within the district and between districts. Signals are carried by the same equipment, on the same fiber that is used to provide voice and data to the buildings.

This network now reaches eight locations and is tied into the statewide two-way video network.

Conclusion

Telecommunications services in the district have expanded greatly in the last few years. The number of telephones in the district has grown from 1,050 to nearly 3,000. Phones have been placed in about 1,400 classrooms, with approximately 600 classrooms remaining. On-line data connections have grown from 25 to over 500. Two-way video classes are being taught daily at eight sites, on a district-operated fiber-optic network that also carries telephone service for those buildings. Sufficient capacity exists on the fiber to serve the networking needs of the district well into the next century.

Costs incurred for expanded service have been offset by savings from new telephone systems, fiber-optic networking, and use of district employees to perform work previously done by outside agencies.

Cluster Session (F54B)

SHIFT and SLO-Lijn: New Ways of Realizing the New Dutch Core Curriculum in Secondary Education

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Keywords: telecommunication, E-mail, distance learning, core curriculum, broadcasting

Abstract

Educational television, E-mail, and curriculum development are integrated in the SHIFT project, a project for basic education in information technology in the Netherlands.

Basic education and the core curriculum

This year (1993-94) secondary schools in the Netherlands will start with the introduction of a national core curriculum for basic education. The so-called attainment targets/core objectives for the 15 + contain four new subject areas: information technology, craft/design and technology, (home)economics, and physical education.

Education in information science is aimed at teaching the pupils to orientate themselves in the world of information processing and systems, thus enabling them, based on examples taken from everyday life, both in this particular subject and in other subjects, to

a. acquire an understanding of the process of collecting, processing, and providing specific data;
b. acquire a basic understanding of the functions of data processing systems so as to be able to use such systems;
c. become familiar with and apply information technology;
d. gain insight into the social significance of information technology.

One of the elements of the core objectives is that children know:

- the basic principles of automated data processing and methods of transferring and transporting data over long distances;
- the possibilities and limitations relating to automated data processing.

E-mail, Curriculum Development and Television Broadcasting: An Integrated Approach

Through the implementation of the core curriculum, the National Institute for Curriculum Development in the Netherlands (SLO), Dutch School television, and PTT Telecom work together in the SHIFT project that involves educational broadcasting, curriculum development (printed lesson material) and telecommunication (E-mail). In this project there is cooperation with the University of Twente (the group of Dr. Betty Collis).

In the presentation special attention will be paid to the telecommunication aspect of the core curriculum and the way the educational E-mail function of (SLO-Lijn) is part of the SHIFT project.

The six school television programs called SHIFT are broadcast in the fall of 1993 at one of the national open channels. Simultaneously, lesson material has been published. The E-mail system SLO-Lijn is an important part of the SHIFT project as a medium for communication among teachers who are going to use the material and as a way of distributing supplementary material.

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Cluster Session (F54C)

Wired Writing: Canada's Writers in Electronic Residence Program

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Keywords: writing, telecommunications, computer-mediated communications

Abstract

Writers in Electronic Residence (WIER) is a national writing program for Canada's schools. Students work with writers, teachers, and one another in a computer conference that focuses on an exchange of original writing and commentary. Well-known authors consider student works, offer reactions and ideas, and guide discussions between students. WIER operates programs for primary, junior, intermediate, and secondary schools.

A teacher in Calgary, Alberta, left me a note on-line. She said that some parents of students involved in the Writers in Electronic Residence (WIER) program had commented on it. One, who was seeking to be a writer herself, said that with all this help, her son would likely publish before she could. Another complained that she only got to read Susan Musgrave, a popular Canadian writer, in her book club, while her daughter was engaged in regular on-line discussions with her from school.

The WIER program can present problems like that. Here are some thoughts on dealing with them.

Where it counts. In the classroom.

Writing with a National Reach

WIER connects writing and language arts students in Canada with writers, teachers and one another in an (often animated) exchange of original writing and commentary. The writers, who are all published, well-known authors in Canada, join students and teachers to read and consider the student works, offer reactions and ideas, and guide discussions between the students.

The program began in the 1987-88 school year at Riverdale Collegiate Institute (RCI), an inner-city secondary school in Toronto, Ontario. Since then, WIER has developed into a national program in Canada. It is now hosted by the Faculty of Education at York University. As of this writing, the program is operating in some seventy schools, with thirteen writers. There are programs for elementary (Canadian grades K-6), middle school (grades 7-10) and secondary school students (grades 9-12). There is some post-secondary involvement from time to time as well, with students in the community college system, and in faculties of education.

How It Works

Students use word processors to compose their works and responses to the works of others before incorporating telecommunications into the process. When the students are ready to offer their work to the program, their writing is sent to the on-line conference, which runs on the host computer at York. Most schools are able to connect with a local area call either via packet-switching services or via Internet.

Most of the original writing is poetry and short fiction. WIER encourages students to submit works that they consider to be in draft stages rather than finished works in order to sustain the value of their interactions with writers and others on the system. Another reason for this is that issues regularly emerge that encourage writing in other forms, often in response to particular issues or concerns expressed in one or more of the submissions. Not surprisingly, textual discussions develop on-line in which students explore their ideas with one another.

A Reflective Community

In WIER the computer conference is seen as a textual medium capable of promoting considered response through written expression and interaction to build a reflective community on-line and in the classroom.

We want students to be in control of the media before them and to utilize these media to broaden the shape and scope of the classroom experience. We want them to consider the value of revision in the writing process and the role that they may play in this for themselves and for others, using language to interpret and understand as well as to be understood. And we want them to revisit their thoughts in light of the ideas they receive to see the world as another might and to respond in the textual environment that on-line computer-conferencing systems offer them.

Partly On-line, Mostly in the Classroom

On a given day, students attending schools from Baffin Island in Canada's high Arctic, to urban centers in the south, and from Newfoundland in the east to British Columbia in the west, offer their own works for reading and comment by the writers and other participants in the program.

What they find is remarkable student writing which reveals that (and how) who we are as Canadians is at least partly the result of where we're from. Imagine, for instance, how Inuit students from Baffin Island might express notions about survival. Their ideas are quite different from those expressed by students who may identify themselves as Canadian-born Chinese from Toronto schools. And they are qüite different from those of Vietnamese students who write about war, about the boats, and about escape and betrayal, yet who also search for ways to express fond memories of family and home, the value of trust, and the details of life as they lived it in Hanoi. Still others consider equity and gender, race, freedom of expression, and other issues of importance to young people.

Talking or Writing?

WIER embraces the reflective nature of asynchronous communication and the considered nature of writing to nurture interaction among the students. Schools are encouraged not to undertake their participation while on-line, for example. Rather, they are asked to capture or download new submissions and responses frequently, print them up, and offer them to students as part of the regular, in-class reading programs in the schools. Students then have the opportunity to consider their thoughts and compose them at a word processor. The files are then sent to the on-line conference when the students are ready to offer their comments to the rest of the on-line group.

In short, the program views computer conferencing as a medium of writing.

Writing, Not Computers

The language that is stimulated by experiences in WIER both orally and in writing, on-line and in the classroom demonstrate that telecommunications-based programs have value in our schools. They are more about tasks than technology. They are more about literacy than about computer literacy. And they demonstrate that the power of online interaction is found first in involving learners in their own learning and then in valuing what they say.

Cluster Session (F55A)

Effects of Anonymity, Saliency, and the Design of the User Interface on the Structure of Interaction in a Computer-Mediated Small-Group Discussion

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Keywords: CMC, interface design, small-group discussion

Abstract

This session reports on a study which investigated the effects of individual identity (salient and anonymous) and a redesigned user interface (graphic-based and text-based) on the structure of individual interaction in a mediated small-group discussion.

Previous research on the use of computer-mediated communication in learning environments demonstrates that the levels of member participation as well as achievement are consistently high when compared to more-traditional learning environments. On closer scrutiny, however, this medium of exchange can have a dramatic impact on the ability of groups to structure interaction across time. One theory suggests that computer-mediated systems break down standard interaction because CMC attenuates the normative social context cues such as gender or status. Consequently, without the implicit social information, participants in CMC feel a greater sense of personal anonymity and less responsibility to the group. On the other hand, it has been suggested that the break down in reciprocal interaction is attributable to a lack of group salience and not to the attenuation of social context cues. Participants who identify strongly with the group are more likely to strive to create norms for group interaction. Finally, it has been suggested that the breakdown in normative interaction is a technological problem which could be resolved by designing new software that could provide better temporal sequencing of comments.

This session reports on a study which investigated the effects of individual identity (salient and anonymous) and a redesigned user interface (graphic-based and text-based) on the structure of individual interaction in a mediated small-group discussion. The results indicate that high group saliency inhibits participation and the development of a structured discourse, whereas the use of an alias encourages more participation and, in conjunction with the graphic-based interface, a more dynamic interpersonal multi-channel discussion.

Data measuring the variables of visits, messages, words, and time were analyzed using a two-way multiple analysis of variance (MANOVA). A significant main effect for identity was found (Wilks' l = .299, F (4.8) = 4.686, p=.030). Post hoc univariate tests revealed that members in the anonymous condition significantly (F (1,11) = 19.439, p = .001) wrote more words (M = 64.8) per message than those in the known condition (M = 11.8). Additionally, anonymous groups significantly (F (1,11) = 1601.1, p = .008) spent longer (M = 22.4 minutes) per visit in contrast to the known group (M = 1.6 minutes).

Further, there was a statistically significant effect (X2 (1, 55) = 16.1413, = .0001) on audience selection by type of interface shown. Notice that students in the text-based condition overwhelmingly chose the undifferentiated group as the target for their comments. In contrast, the graphic-based condition supported many more-directed interpersonal interactions (62 percent).

Additionally, the identity of the participants had a significant statistical effect: X2 (1,55) = 4.3421, p = .0372 on audience selection. The students were much more likely to participate if they were in the anonymous condition. In contrast, members who were known to each other were three times more likely to make a general comment to the group instead of to a particular individual. The anonymous graphic-based condition seems to have encouraged a more dynamic multi-channel interpersonal interaction analogous to face-to-face group interaction.

These findings have important consequences for the instructional use of CMC. Research in classrooms has observed that older students volunteer less and ask fewer questions as they move through school. It has been suggested that the traditional classroom trains students to respond with only enough information necessary to answer the question appropriately. The findings in this study support this observation. Consequently, implementing mediated learning systems is essentially a problem of design.

In real-time environments, interpersonal interaction is determined by the quality of the implementation of specific strategies, such as cooperative learning, that encourage a high level of interaction. The students in the known condition were not willing to risk longer or more complex interaction. Under the protection of anonymity the comments became longer and the student spent more time engaged with the material. It is simply not enough to provide students with the opportunity for peer interaction by employing computer technology, but the traditional role of the teacher as judge also must be altered in meaningful ways for students to risk further interaction.

Cluster Session (F55B)
Quality of Fourth-Grade Students' Compositions Written after Telecommunications Treatment

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Keywords: composition, quality, telecommunications, bulletin board treatment, study

Abstract

This eight-month, quasi-experimental study measured the effect on inner-city fourth graders' writing quality of a home telecommunications treatment. Although the 27 experimental subjects showed higher gains in posttests over the 11 control subjects, the gains were not statistically significant at p.05. Studies involving more subjects are needed to assess the effectiveness of this new technology on writing.

Writing is the curriculum priority most often neglected, according to a Carnegie Foundation study. Educators during the past ten years hoped that technology in the schools would improve writing, yet research is inconclusive on the computer's benefits to writing. Few studies have assessed the effects on writing growth when telecommunications treatments are used.

The opportunity to conduct a telecommunications study arose when an innovative partnership was formed between educators (university and elementary school) and a private-sector telecommunications corporation. This corporation provided at-risk students with telecommunications terminals in their homes for bulletin board participation. The aim of the partnership was to enhance, not replace, school instruction through an economical, curriculum-driven electronic delivery system, accessed through students' home telephones.

This study measured the effects of the at-home telecommunications treatment on the fourth graders' writing. Both experimental and control groups wrote compositions in their classrooms in February and the following October. Data were examined for 27 experimental subjects and 11 control subjects.

The experimental group treatment lasted seven months, including summer vacation, providing a private bulletin board service on which subjects wrote to graduate students, their teachers, and their classmates. Graduate students encouraged the subjects to respond to story starters, to write descriptions, and to share their ideas in writing, while modeling through their own written discourse.

From March through September, these subjects accessed writing programs an average of 8.2 hours monthly. The first month of operation was the busiest, with 26,757 minutes tracked by electronic equipment. The most messages posted in a given week was 670, and one prolific fourth grader posted 120 messages in one single week. Normally, four or five students would post just one message weekly; three or four would write 15 or 20 messages; and a couple of fluent writers would post more.

Effects on writing quality and fluency were assessed by focused holistic scoring of compositions and by word count. Using the Texas Assessment of Academic Skills scoring rubrics (0-4 points), both groups showed improved posttest means in narrative compositions, total (both descriptive and narrative) compositions, and fluency. For example, the experimental group's pretest/posttest medians increased from 154 to 220 words, while the control group's medians increased only from 155 to 183 words. The experimental group also showed improved descriptive compositions while the control group showed decreased achievement. Even though the experimental group showed greater gains, they were not statistically significant ($p<.05$), using the Mann-Whitney U Test to compare the two groups' posttest means.

To avoid the possibility of committing a Type II error, the researcher supported the first analysis with a second scoring using another scale (1-6 points), developed by an expert reader/scorer. With this scoring, both groups showed improved posttest means in descriptive, narrative, and total compositions. While gains for the experimental group were greater, no gains were statistically significant ($p<.05$), using the Mann-Whitney U Test to compare the two groups' posttest means.

Students in the experimental group showed positive changes in their writing styles by including more dialogue, more elaboration, and stronger voice in their posttest writing.

They enjoyed their first experience of being "technology have's" rather than "technology have-not's." They wrote to university students and faculty, each other, teachers, and the principal. They spent time on task at home learning as they connected reading and writing. They had control of their own learning. Who can predict the impact of their electronic discourse?

Cluster Session (F55C)

A Model for Evaluating Tel-Ed Electronic Health Groups

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Keywords: evaluation, Tel-Ed, electronic, health

Abstract

This study compared sixteen health related electronic discussion lists. The lists were selected according to three criteria: (a) relevant to nursing and health care, (b) listed on Hancock's Medical Resource guide, and (c) data collected by a volunteer student. A single rater used a codebook to input seven variables of interest. The authors believe that electronic highways are rapidly increasing and in the future you, your family, and/or your patients may be participants in one or more of these type lists. A "snapshot analysis" provides one model for evaluating electronic lists.

Introduction

Using a computer is frequently associated with obtaining technical information rather than linking other humans for social connectivity. Technology is rapidly creating opportunities for electronic connectivity in all areas of the health care field. These electronic linkages among individuals are generating diverse opportunities for computer-assisted communication to provide a wide range of information and human support for individuals facing similar situations. Our focus is on a very specific aspect of computer-mediated communication: health care information discussion lists. The most recent version of Lee Hancock's guide to Internet/Bitnet Health Sciences Resources lists over three hundred related sources of electronic discussions. Sixteen health care lists were selected to serve as a foundation for comparison and development of a model. Messages for each list were analyzed to identify the qualities possessed by these potential health care support systems. The research presented in this article is directly modeled after ProjectH, a global research project composed of over one hundred researchers, working collaboratively to quantitatively investigate variables related to the process of computer-mediated communication. The coordinators of

ProjectH are S. Rafaeli (Hebrew University of Jerusalem) and F. Sudweeks (University of Sydney).

Statement of Problem

Health care faces enormous problems in providing the necessary support to clients in need. The current condition allows for treating conditions medically, with little time, staff, or money available for the often needed support associated with various health situations. Support groups have existed in society for years and can be instrumental in providing this needed assistance. A new type of support group is emerging on computer networks and has the potential to provide support and information for health care needs. Utilization of such resources appears to be on the rise, yet awareness of these health care information electronic lists is by no means widespread. It is necessary to distinguish what similarities and differences do exist among lists in order to identify how useful these resources may become to the health care industry.

Methodology

The methodology used in this study was predominantly a scaled-down and modified version of the ProjectH design. It was conducted as a very narrow, preliminary investigation of a conveniently selected electronic client information list. The objective was to identify the similarities and differences among a select group of electronic discussion lists to characterize the type of support that this new forum is able to supply to health-related information and education.

Subjects

The subjects are defined as the subscribers or "client" of an electronic information list who sent a message. In essence, the subjects were not chosen, but rather were included in this study based on their participation on a selected health care information discussion list. Sixteen electronic information lists were chosen for the study. Table 1 contains the sixteen health-related electronic lists, a brief description of each, and the number of messages collected from each list within the criteria of 30 messages or 30 days.

Table 1. Electronic Lists, Descriptions, and Messages Analyzed

List Name	Description	Messages Collected
BACKS-L	Research on low back pain and disability.	7
C+HEALTH	C+Health is intended to promote sharing of information, experiences, concerns, and advice about computers and health.	30
CFS-L	Chronic fatigue syndrome discussion list. This list seeks to serve the needs of persons with CFS by enabling a broad discussion of CFS-related topics.	30
DEAF-L	Deaf discussion list.	30
DIABETIC	Open discussion forum for diabetic patient counseling.	30
DIET	Support and discussion of weight loss.	30
DRUGABUS	Drug abuse education information and research.	24
FIT-L	Wellness, exercise, diet. Fit-L is a discussion list for exchanging ideas, tips on any type of information about wellness, exercise, and diet.	30
GERINET	Geriatric health care discussion group.	9
GRANOLA	Vegetarian discussion list.	30
HEALTH-L	International discussion on health research.	8
HOLISTIC	Discussion list dedicated to providing information and discussion on holistic concepts and methods of living .	30
MSLIST-L	Multiple Sclerosis discussion and support.	18
PANET-L	Medical education and health information discussion.	14
SMOKE-FREE	Support list for people recovering from addiction to cigarettes.	24
SOREHAND	Discussion of carpal tunnel syndrome and tendinitis.	15

List descriptions compiled by: Hancock, L. (1993). Internet/Bitnet Health Sciences Resources (version 06-15-93). Educational Technologist, Educational Technology, A Division of Dykes Library. University of Kansas Medical Center 66160-7181. (913)588-7342.

The term "client" was used in its broadest meaning to represent any person who might need or want information or support related to improved health or lifestyle. The lists selected are not inclusive and represent a convenient sampling from Hancock's Healthcare Resource list based on personal choice of graduate student volunteers.

Data Collection

Graduate students assisted with the collection of messages for the electronic lists selected. Students subscribed to the list of their choice, saved messages in chronological order, and printed the entire batch at either the end of 30 days or after they had accumulated 30 messages. Four lists were eliminated because of technical problems in acquiring messages. Once all messages were collected, each message on each list was coded to identify the characteristics of the information list. All 11 variables for each message were coded by the same researcher for consistency of interpretation.

Results

Half of the selected lists had a high enough frequency of activity that 30 messages were collected in less than 30 days. These high-activity lists were C+HEALTH, CFS-L, DEAF-L, DIABETIC, DIET, FIT-L, GRANOLA, and HOLISTIC (see Table 1). The remaining lists, with fewer than 30 messages collected in 30 days, still exhibit high activity in spurts. Of the 8 lists with fewer than 30 messages collected, all had 63 percent or more of the messages occurring within 5 days. This suggests that activity picks up when topics are introduced.

Demographic data are limited to information supplied by the routing information or intentionally specified by the author, or subject. Based on signatures and addressing information, data were collected for gender, status of author, and origination of message. Figure 1 presents the findings for gender and origination. The percentages of known gender indicate that messages sent are about equally distributed between males and females. Gender was coded as unknown when a signature was not included in the body of the message or addressing information, or the gender could not be determined from the name specified. Whether the message originated from the United States or outside of the U.S. was attained through addressing data or identifiers within the body of the message. There is a potential bias on the part of the coder in that U.S. academic institutions are known, but non-U.S. academic institutions may be identified in a manner that the coder is unfamiliar with. It is therefore likely that more of the messages coded as unknown have non-U.S. originations. Despite this, 14 percent of the messages did clearly originate from outside the U.S.

The "Status of the author" variable intended to identify whether practitioners in general identify themselves as an "expert" source of information. Only 5 percent chose to identify themselves as practitioners. The highest occurrence of practitioner identification was only 2 percent and it occurred on the diabetic discussion list.

In measuring the response time between messages, a major similarity was identified: 83 percent of the messages occurred within 24 hours of the preceding message. For the lists with substantially fewer than 30 messages, response time was quick also. As speculated earlier, this may be due to spurts of interest and lulls between topics.

Messages were analyzed to identify the appropriateness of the message for the list,—specifically, if the message was misdirected and should not have been sent to the particular list. Eighty-two percent of the messages were directly related to the purpose of the list. The remaining 18 percent were either misdirected (7 percent) or intended for the list, but were not regular message (11 percent). An example of a message that was intended for the list but not a regular message would be something similar to "I would like to subscribe to this list." Clearly the majority of messages were appropriate and discussions were related to topics as specified.

Table 2 provides the frequencies of the overall nature of the messages for each specific list.

Table 2
Frequency Table: Overall Nature of Messages

	Primarily Providing Info.	Primarily Requesting Info.	Primarily Persuasive	Primarily Opinionated	Mixed Style	N = Number of Messages Collected
BACKS-L	57.14%	14.29%	0%	0%	28.57%	7
C+HEALTH	46.67%	33.33%	3.33%	6.67%	10%	30
CFS-L	30%	16.67%	20%	16.67%	16.67%	30
DEAF-L	36.67%	6.67%	0%	30%	26.67%	30
DIABETIC	40%	0%	16.67%	30%	13.33%	30
DIET	43.33%	6.67%	23.33%	16.67%	10%	30
DRUGABUS	54.17%	37.5%	4.17%	4.17%	0%	24
FIT-L	46.67%	20%	13.33%	16.67%	3.33%	30
GERINET	44.44%	22.22%	11.11%	22.2%	0%	9
GRANOLA	23.33%	30%	16.67%	23.33%	6.67%	30
HEALTH-L	12.5%	87.5%	0%	0%	0%	8
HOLISTIC	33.33%	30%	10%	13.33%	13.33%	30
MSLIST-L	38.89%	16.67%	5.56%	16.67%	22.22%	18
PANET-L	46.15%	15.38%	0%	30.77%	7.69%	13 (missing value = 1)
SMOKE-FREE	16.67%	8.33%	25%	33.33%	16.67%	24
SOREHAND	40%	46.67%	6.67%	0%	6.67%	15

The highest percentage of messages providing information occurred on the DRUGABUS list. The lowest percentage of providing information was found on the HEALTH-L, yet this list had the highest percentage of information requests. The list with the lowest percentages of information requests were DEAF-L and DIET. None of the lists were predominantly persuasive in nature. The highest occurrence was found on the SMOKE-FREE list; with 25 percent of the messages persuasive in nature, and it was also the list highest in opinionated messages. Three lists had no persuasive messages: DEAF-L, HEALTH-L, PANET-L. None of the lists were dominated with mixed-style messages.

Finally, the last variable attempted to determine how understandable the message was. This item was coded one of four ways: completely clear (every sentence/phrase/idea makes sense), mostly clear (the majority of sentences/phrases/ideas make sense), mostly unclear (the majority of sentences/phrases/ideas do not make sense), and completely unclear (every sentence/phrase/idea does not makes sense). Of 358 messages, 83 percent were mostly to completely clear. Conversely, 4 percent or 17 of the messages were completely unclear.

Conclusions

The following conclusions were reached based on our preliminary study:

- The majority of lists selected were characterized as "high activity," meaning response time between messages was 24 hours or less.
- Lists were approximately evenly distributed between males and females.
- The majority of the messages originated from the United States, but 14 percent of the messages clearly were from outside the U.S.
- Few practitioners tend to identify themselves as such.
- Messages typically were pertinent to the specific topic of the list; only 18 percent of the messages were not directly related to the topic.
- 83 percent of the messages were understandable.
- More messages were providing information than requesting information; fewer than 30 percent of the messages were persuasive or opinionated; and only 12 percent contained more than one communication style.
- There is no evidence to suggest a relationship between low activity/high activity and measures of quality.

Model Development

ProjectH represents a complex process of quantitatively reviewing 49 variables while this study looked at just 9. We have concluded that a snapshot model based on a review of 30 messages can provide an effective method to qualitatively and quantitatively evaluate individual lists. In order to determine the overall primary nature of a list, a category of "supportive" statements needs to be added to ProjectH's categories: providing information, requesting information, persuasive, opinionated, and mixed. The "snapshot" model has three components: list description, number of total membership, and measures of list activity (amount of time needed to collect thirty messages, length of messages, number of identified "health professionals," length of message thread of ideas, time of responses to messages, and overall nature of the list). One list, DIABETES, was selected for "snapshot analysis" (see Figure 1). This analysis quickly reveals that DIABETES is an active list which meets a variety of needs for participants.

Snapshot Analysis: DIABETES
List Description
Open forum to exchange views
problems, anxieties, and other
problems related to Diabetes.

Total members: 111

List activity (n=30 messages)
30 messages in 12 hrs. and 46 mins.

Length of messages: 2-27 lines

Number of identified "practitioners"
2 (1 MD, 1 "clinical psych")

Six messages in longest thread

Response time variation for one thread
11 minutes to 2 hours, 12 minutes

Overall nature of list
33 percent of messages supportive in nature

Figure 1

It is obvious from this preliminary study that individuals with very specific health care needs are actively participating in electronic networks. With the emergence of these human support electronic information lists comes a need for health care providers to become involved with this resource as providers of information as well as receivers of information. These resources have the potential to greatly enhance desperately needed health care support systems. The ultimate evaluation will be each individual's opinion of "personal benefit."

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Cluster Session (F57A)
Global Telecommunications: Brevard Reaches Out

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Keywords: global, telecommunications, environment, cultures, Florida, FIRN

Abstract

Students in Brevard County on Florida's central east coast are reaching out through telecommunications across Florida and the world. Elementary, middle, and high school students participate in varied statewide and district telecommunication activities in addition to sharing environmental and cultural information globally.

Introduction

Students in Brevard County, Florida, share environmental and cultural information by telecommunicating globally via FIRN (Florida Information Resource Network) and Internet. FIRN is free to all Florida educators and their students. Internet can be accessed easily in FIRN. The following are some of the Brevard projects.

Fairglenn Connections

Projects at Fairglenn include telecommunicating with the local science museum, using Prodigy to access an encyclopedia, in the media center accessing the public library system, using FIRN to gather educational research through ERIC and LUIS as well as a group conference called Resource Center, and accessing NASA Spacelink to get the latest information concerning the space program. Experienced FIRN members gather Internet messages and post them as a group conference for appropriate use by Florida educators. Students and teachers "chat" with others around the state as they discuss common interests.

A fourth-grade class tests water in the Indian River Lagoon. Results are sent in and used as part of the data kept by the Marine Resources Council. This project will pay for a telephone line. A scientist from NASA, our business partner, initiated a program called "Ask an Engineer." Students send him questions about the shuttle or engineering, and actual experts send back responses.

A sixth grade class sends E-mail to the teacher's cousin at Antarctica's McMurdo Base. The students have learned a great deal about the environment of this unique ecosystem. Two fifth graders communicate with Kirill in eastern Russia. The boy in Kirill must travel across town to access a computer. Third-grade students exchange cultural information with a classroom outside the city of Sydney, Australia. These projects and others will be presented during this session.

Global Environment/Cultural Exchange Project

Kathy Huggard-McKinney's vision of students telecommunicating globally and sharing environmental and cultural information began two years ago. It took two years filled with frustration and determination to make the dream a reality. The dream was for Tropical Elementary students to telecommunicate globally.

There was one big obstacle: finding schools and students around the globe who would like to and who were able to telecommunicate with Tropical Elementary students. Through FIRN, other teachers across the state provided Internet addresses of interested schools and educators.

The National Educational Computing Conference 1993 was another source of Internet contacts. Huggard-McKinney talked with several educators from different parts of the world who were interested in joining Tropical Elementary School in a special global environment and cultural project.

The main idea behind this project is to allow the different participants to share information with each other on a particular environmental issue, e.g., an endangered species. Participating students study about a particular issue and share via Internet both environmental and cultural information with the other students in the United States and around the world. Information derived from the technology center's weather satellite receiving station is shared.

Tropical students send student-produced videos an environmental magazine they wrote, photographs of themselves and printed copies of weather satellite photos, etc. Complete details about this sharing and suggestions in starting up an Internet project will be discussed and will be part of the handouts.

Other Brevard Projects

Carol Robitschek's students play chess "live" using FIRN's "chat" mode. They also write part of a story and send the story on to the next class in Florida, which adds another section to an original story.

Rick Kiper's Satellite High School Science Research students have been using the Internet as an invaluable tool for research. Students have made international contacts with experts in their field of study. Instead of going to the local public library, the young researchers perused the holdings of university libraries all over the nation. Through the interlibrary loan program, they have obtained their materials. Some students have participated in USENET discussion groups and many have downloaded (via FTP) text files, applications, and simulations which relate to their projects.

Other Brevard projects will be discussed and shared at our cluster session.

Cluster Session (F57B)

Making the Global Connection: Telecommunications in a K-12 Environment

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Using a collaborative model, the Columbia Public Schools along with the University of Missouri-Columbia, the City of Columbia, the Daniel Boone Regional, and the Missouri Research and Education, are participating in a unique telecommunication project called COIN. Through this project we are creating the "Global Classroom." Using a microcomputer system, modem, and phone line, Columbia students now have access to information from the community, state, and world to assist them in their curricular needs.

The Columbia On-Line Information Network (COIN) is a community computer service which provides open access to on-line information for Columbia and surrounding areas. It has been developed to provide the community of Columbia with a way to disseminate information, discuss issues electronically, and access resources and information. More importantly, it provides a method of involving and educating the community on the emerging needs and tools of an information-based society. Two specific facets will be addressed:

1. The Wide Area Information System for Education (WISE). WISE uses COIN to provide access to teachers, administrators, and students in the Columbia School District. It also allows faculty at the University of Missouri-Columbia to interact with the school district teachers, providing curriculum resource materials, mentoring programs, et cetera.
2. The second facet is our Internet project in which students and teachers are accessing the "Super Electronic Highway." By creating the Global Classroom, our students are now accessing Supreme Court decisions, oceanographic databases, NASA materials, college entrance requirements, scholarships, and other information worldwide.

Cluster Session (F57C)

Shrinking the World While Expanding Horizons: Telecommunications in the Virgin Islands

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Keywords: telecommunications, FrEdMail, international

Abstract

Telecommunications provides an effective and inexpensive means of enhancing the educational horizons of students in geographically isolated areas. Using FrEdMail, AT&T's Learning Network, National Geographic's Kids' Net, and other educational communication highways, students in the Virgin Islands have collaborated with peers from around the world on a number of projects. The presentation gives a view of what it takes to provide this powerful tool to students, what they have accomplished using telecommunications as a motivating medium, and what the future plans are for telecommunications in the Virgin Islands schools.

Cluster Session (F58B)
Overcoming Isolation in the Teaching/Learning Process: An Australian Experience

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Keywords: Distance education, videoconferencing, educational technology

Abstract

This paper describes and reflects on a research project in process by (1) locating it in the sociopolitical context within which we conducted our research and (2) identifying the issues which enabled/constrained the research process as well as its implementation.

The Context

Australia is a country characterized by vast distances and a high degree of centralization of population centers mostly located in the coastal regions resulting in powerful urban nuclei controlling large, relatively sparsely populated areas. At the level of policymaking, implementation, and funding, the responsibility for educational provisions rests with both state and federal governments. Both of the major Australian political parties emphasize their intention to foster equal opportunity of access. A group which has been identified as disadvantaged in terms of access to higher education is made up of people from rural and isolated areas.

The Project

Results from an earlier study, which sought to identify the needs of rural students, identified costs associated with studying at a distance as a major disadvantage. Any innovation designed to minimize distance in the teaching/learning process within the context of distance education needs to be affordable by students and ought not to disadvantage, already disadvantaged groups even further.

In terms of the teaching/learning process, isolation from other students and access to tutors, coupled with a lack of a sense of belonging, were — not surprisingly — cited as major disadvantages by students. Furthermore, students expressly identified videoconferencing and videos of lectures as the two most important provisions which they felt could help to overcome those disadvantages.

The purposes of this project, therefore, were to increase the level of interaction between rural students and the university; provide more opportunities for interaction with peers and more personal contact with tutors and to consider efficacy and cost efficiency of including two instructional mediums, other than print, as integral components of external studies learning packages.

In an attempt to meet students' needs we integrated two different technologies into two different, print-based courses. One course incorporated videoconferencing to facilitate greater student-student and student-tutor interaction, while the second course included in its usual learning package a video which introduced students to the tutors and provided an overview of the course, detailing aims and objectives as well as expectations in terms of readings and assessment.

Outcomes

Questionnaires were administered to all students enrolled in these courses, both before and upon completion of the course. Students' responses indicated that our aims were realized. For example, of those students who participated in videoconferencing, 86 percent strongly agreed with the statement "External students are given a feeling of belonging to the university community through videoconferencing." While only 23 percent of the students with the video responded "strongly agree" to the statement "I feel part of the university community," an additional 38 percent "slightly agreed" with this statement.

Overall, responses from students involved in videoconferencing were consistently more positive than responses from students who were mailed the introductory video, although both groups did indicate positive changes.

Reflections

There is no doubt that the introduction of videoconferencing and, to a lesser extent introductory videos, into existing print-based courses goes some way toward overcoming some of the disadvantages faced by external students. There are, however, four major issues — cost factors, lack of time to explore different ways of doing things, lack of technical expertise, and appropriate teaching strategies and assessment structures — which need to be addressed before technologies other than print can usefully be incorporated on a large scale.

Tel•Ed '93 Proceedings Insert

Educational Telecomputing Project Structures for Pre-College Online Activity Design

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Key words: educational-activities, activity-structures, instructional-design, Internet

Abstract

Fifteen diifferent educational telecomputing activity types are presented, with examples for each collected from teachers' postings to Internet discussion groups during the past three years. The author suggests that encouraging teachers to design experiences modeled upon activity structures is more facilitative than asking them to adapt specific telecomputing projects that have been successful in other classrooms.

Do you wonder about how to meaningfully integrate use of Internet informational and interpersonal resources into your students' academic explorations? The purpose of this paper is to help you to plan for that integration by presenting 15 different *types* of educational telecomputing activities.

Many of us who roam the Internet are "idea collectors." We are intrigued by the notion of a functioning, de-centralized, democratic, and geographically unbound system that encourages the free exchange of thought. We tend fill diskette after diskette with files from FTP archives, newsgroup postings, and LISTSERV messages containing information that we believe can be used or shared. (Whether or not that actually happens depends mostly upon the extent of our organizational skills…and the capacity of our hard drives!) When I engage in "electronic prospecting," I collect ideas on how to use telecomputing tools in educational contexts; specifically, the *structures of on-line educational activities.*

Recently, I've sorted through my many files of Internet-based activity ideas, and have found that they can be classified into 15 structural categories. I will present the categories here, with sample project descriptions for each. I do this hoping that reading about these activity *types* will help you to plan effective telecomputing explorations for your students that are fully integrated into their curricularly-based courses of study.

Person-to-Person (or People) Exchanges

The most popular type of educational telecomputing activity is one in which individuals "talk" electronically to other individuals, individuals "talk" to groups, or groups "talk" to other groups. Since all teachers with Internet access can use electronic mail, many of these project types employ Email (sometimes via LISTSERV discussion groups) as the common context for exchange. Other teachers and students use newsgroups and Internet-connected bulletin boards for projects such as the ones listed below.

1. keypals

This is probably the most commonly-used telecomputing activity structure, similar in form to surface mail penpal activities. While student-to-student *keypal* exchanges involve more managerial work than many teachers have time to devote, group-to-group exchanges, especially those with a particular study emphasis, can evolve into fascinating cultural explorations without overwhelming activity facilitators with the transfer and processing of electronic mail.

Keypal activities are perfect conduits for language study. Here, for example, is the introductory message (with translation) from a group of students who live near Paris, and wished to learn about classes from other parts of the world in which other students study computer use.

BONJOUR

Nous sommes des eleves de quatrieme technologique et avons entre treize et seize ans. Romain Rolland est un college mixte, situe a CLICHY SOUS BOIS, dans la banlieue de PARIS. Les eleves d'une classe technologique doivent travailler sur des projets en faisant beaucoup de technologie et d'informatique. Nous voulons communiquer avec vous, pour mieux vous connaitre.

De quelle classe etes vous ?
Ou se situe votre college ?
Faites vous de la technologie ?
Travaillez vous le samedi matin, le mercredi ?
Quels sont vos loisirs preferes ?

Nous voulons aussi communiquer avec vous pour que vous puisiez nous aider dans nos recherches sur le theme du jeu.

HELLO

We are a group of pupils, aged from 13 to 16 in 4eme technologique. ROMAIN ROLLAND is a mixed located in CLICHY SOUS BOIS, in the suburbs of PARIS. In a technology class, pupils must develop projects related to technology and computing . We want to communicate with you, in order to know you better.

- What is your class ?
- Where is your school located ?
- Do you take technology courses ?
- What are your favorite activities ?

We also want to communicate with you to get information on the subject of games.

As engaging and easy-to-implement as projects such as these are, please don't stop reading here and race to your lesson planbook! There are many other powerful activity structures to follow.

2. global classrooms

In this variation upon the "group-to-group keypals" activity structure, two or more classrooms (located anywhere in the world, of course) can study a common topic together, sharing what they are learning about that topic during a previously-specified time period. For example, two American Literature classes in two different schools studied *The Glass Menagerie* together in 1991, discussing the play by electronic mail.

In a larger-scale effort to involve many classes in HIV/AIDS awareness, Rhea Smith from the Jenkins Middle School in Palatka, Florida, organized a month-long series of activities designed so that her students "help[ed] teachers, parents, and children to understand the dangers of the HIV/AIDS virus and formulate a plan to remain HIV/AIDS negative." The "electronic schedule of events" looked like this:

Schedule of Events:
Feb. 1st-15th Registration
March 1-5 What is the HIV/AIDS virus?
March 8-12 AIDS and Education
March 15-19 AIDS Testing
March 22-26 Your student oath to remain HIV/AIDS negative and The Wall of AIDS messages

Suggestions for discussion and action for each week of activities was included in the plan. For example,

WEEK FOUR EVENTS
MARCH 22ND-26TH:

On April 7th Jenkins Middle School students will be having an AIDS Awareness Day along with the Opening Ceremonies of the new AIDS Voice Mail system. We will have eyewitness news and other major TV news and newspapers here.

We would like to have a wall of AIDS messages from students, teachers and professionals. The theme is "I am HIV negative and here are the ways I will remain HIV negative for the rest of my life." Please have your students construct a message on this theme or an important AIDS message they would like to share with everyone. These messages will be decoratively displayed on a huge wall for viewing by media, students, parents, community members, and visiting guests.

Students and teachers participating in this month of thematically-related activities shared their discussions on FrEdMail bulletin boards and through electronic mail.

3. electronic "appearances"

Electronic mail, newsgroups and electronic bulletin boards can also "host" a special guest, with whom students can correspond either asynchronously, as is most commonly done, or in "real-time" (with the guest and the students typing back and forth to each other synchronously, using a *chat feature* that is available with many electronic mail systems).

4. electronic mentoring

Internet-connected subject matter specialists from universities, business, government, or other schools can serve as electronic mentors to students wanting to explore specific topics of study in an interactive format. The Cleveland Freenet's *Academy One* project hosts, for example, an activity called *Spotlight on People,* which helps students communicate with leaders, inventors, authors, and other professionals who are well-accomplished in their fields. In another mentoring project, undergraduate students at the Oranim Teacher's College in Israel served as mentors on the subject of *prejudice* when communicating with high school students for two academic semesters from England, Australia, the United States, Ireland, and Israel. Finally, a "matching service" called the *Electronic Emissary*, sponsored by the Texas Center for Educational Technology and the University of Texas at Austin, helps volunteer subject matter experts from all over the world and teachers and their classes find each other, structure a mentoring project, and share what they learn together by communicating with electronic mail.

5. impersonations

Impersonation projects are those in which any (or all) of the participants communicate with each other "in character." At the University of Virginia, for example, educational history professor Jennings Waggoner "became" Thomas Jefferson via electronic mail for several local elementary classes studying Virginia history. In *Characters Online*, an Internet-based project sponsored by the Nebraska State Department of Education and the University of Nebraska at Omaha, undergraduate preservice teachers used electronic mail to impersonate the main characters from books that students in elementary classes in eastern Nebraska were reading with their teachers.

Students can also write messages or public postings in character for other students to read. In the *California Missions* project, coordinated by Nancy Sutherland from the FrEdMail Network, 21 fourth grade classes in California (one for each of the 21 California missions) wrote and shared fictitious journal entries that described the lives and aspirations of people who participated in the missions in the early and middle 19th century. Ray Medeiros, from Dighton Middle School in Somerset, Massachusetts, organized a collaborative exploration of Colonial America called *Colonial Computing*, in which students at different sites formed fictitious Colonial families, and exchanged letters that contained historically accurate details of Colonial American life.

Information Collections

Some of the most successful educational telecomputing activities involve students collecting, compilng, and comparing different genres of interesting information.

1. information exchanges

There are many examples of thematically-related information exchange that have been employed as popular telecomputing activities. Students and their teachers from all around the globe have collected:

- folk games,
- slang words,
- jokes,
- proverbs,

- folktales,
- local agricultural information,
- personal health information,
- culture-specific holiday descriptions,
- idioms,
- and hometown "tourist information," to name just a few.

This type of activity can involve many classes without becoming an overwhelming management task for teachers, and is a particularly powerful application of telecomputing tools because children become both the creators and consumers of the information that they are sharing. Projects like these typically begin with a call for participation that is posted by a classroom teacher, such as:

ORILLAS, a multilingual network for teachers and
students interested in cross-cultural learning,
announces a new group project:

INTERNATIONAL FOLK GAMES COLLECTION

_____ How to play the game _____
_____ Group report on playing game _____
_____ Interviews with peers or adults _____
_____ Illustrations _____
_____ Memories _____

All grade levels and languages welcome!
We'll share the games and student
writing with all participating classes.
We hope you and your students will join us!

--<>--<>--

"Cuando la escuela presenta el folklore a los ninos esta' dandoles el mensaje de que reconoce la riqueza cultural presente en el hogar. Esta validacion de la familia y la comunidad es de maxima importancia..." [Alma Flor Ada, prize-winning author of Spanish-language children's literature]

"Studying folklore in the schools gives students an appreciation of the richness of their cultural heritage. This validation of the family and community is of maximum importance..."

Kristin Brown, Enid Figueroa & Dennis Sayers, ORILLAS Co-directors

Sharing information that is intrinsically interesting to children on an international scale is an excellent way to engage students in cultural exchange.

2. electronic publishing

Another type of information collection and exchange can occur with electronic publishing of a common document, such as a newspaper, poem, or literary magazine. For example, David Egan, a social studies and history teacher at Cold Spring Harbor High School in Long Island, New York, coordinates an international student news magazine called *The Contemporary* through the I*EARN (International Education and Resource Network) project. Students do the majority of the work on the document. *The Contemporary* is published two times during each school year, with hope that "through peer education students can be made more aware of the problems our world faces and how young individuals can become more active participants in the broad movement to improve the condition of our planet."

A Vision, a similar I*EARN project at Cold Springs Harbor High School, is a "global literary magazine," coordinated by Maureen Ackerman, David Egan, Niko Clifford and Brian Fox. The goals of producing *A Vision* are "to provide a worldwide forum where students can express their thoughts and feelings through poetry, prose, art and photography as a means of advancing cultural sharing and understanding" and "to produce a magazine of this work so others may benefit from the sharing that has gone on." In a similar project for younger children, budding science fiction writers contributed to an anthology put together as an adjunct to an on-line Solar Sailing Simulation coordinated through the Cleveland Freenet's *Academy One* project during the fall of 1992.

Electronic publishing can also be accomplished with many students working on the *same piece*, rather than the *same collection*. Students on the FrEdMail network, for example, have collaboratively created a "Global Peace Poem" (conceived and coordinated by Yvonne Andres and Mary Jacks) that has circled the globe several times as each class of students in each location added a stanza after having read the verses that other classes had previously appended to the (electronically epic) poem.

3. database creation

Some information exchange projects involve not only collecting, but also organizing information into databases that project participants and other students can use for study. One such project is the *Seasons* project, developed by Nancy Sutherland and Al Rogers.

Project Name: SEASONS—Spring (c) January 27, 1993
FrEdMail Foundation

This project was developed by Nancy Sutherland and Al Rogers of the FrEdMail Foundation.

Date: Feb. 15 - May 17

Purpose: To bring to students an awareness of the seasons, how they change and progress, how they vary across the nation and around the world, and how to use the newspaper to determine what those changes are in local and distant places.

To use a database to collect, organize, and query information in order to draw conclusions and answer questions about the data.

Subjects: Science, social studies, math, language arts

Grade Level: 3 - 8

Summary: Students will use the weather section of the local newspaper as well as their own measurements to daily chart the temperature, rain fall, time of sunset and sunrise, etc. to determine weather patterns and how the seasons change and are affected by such things as elevation and latitude. Students will enter this information in a standardized data base template. Articles found in other parts of the paper may also be valuable in providing information.

Students will also provide a brief SUMMARY of their observations of the seasonal changes. Both the SUMMARY and the DATA BASE will be shared with other participants and used to chart weather and seasonal changes throughout the nation or world.

This project will be run once each semester—in the spring and fall.

Number of Participants: approximately 30 classrooms

Note that successful projects of this genre are well-structured; they have a definite time schedule, requirements for participation are clearly stated, and teachers are asked (often by filling out a registration form) to commit to following these guidelines.

4. Tele-FieldTrips

The FrEdMail folks encourage Internet-connected teachers and students to share observations and experiences made during local fieldtrips to museums, historical sites, parks, zoos, etc. with teachers and students from other cities, states, and countries. Nancy Sutherland maintains a monthly schedule of fieldtrip information posted by schools throughout the Internet, and sends this schedule to interested teachers, so that if an upcoming fieldtrip will yield information pertinent to a particular class' curriculum, questions can be sent to the children scheduled to take the trip to answer while on the outing.

Electronic fieldtrips can also be taken and shared without leaving the classroom, as students share information about the places in which they live. A fifth-grade class in Blacksburg, Virginia, for example, sent the following request for information on islands out to a number of different LISTSERV groups, appending a list of specific questions for other classes to answer.

We are students in Mrs. Beck's class at Price's Fork Elementary School in Blacksburg, Virginia USA. We are studying islands of the world and we want to find out what your island is like.

Here are the islands we are studying:

Corsica
Cuba
Haiti
Antarctica
Marshall Isles
Japan
Ascension
Galapagos
Cyprus
Coats
Tonga
Tasmania
Iceland
Fiji
Revillagigedo

If you live on any of these islands now, or if you have visited one of them, please help our fifth grade class learn more about these islands. If you could answer some of these questions for us, we will print them out and use them in our class.

Thank you very much. We are very honored to be talking with you.

"Fieldtrips" (actually, *expeditions*) taken by experts are even shared on the Internet. The *International Arctic Project*, a "multi-national expedition across the Arctic Ocean by dog sled and canoe," is described and updated by teachers involved with the World School for Adventure Learning through the "Kidsnet" LISTSERV group. During a recent expedition undertaken by two explorers from the United Kingdom, participating classes received weekly detailed descriptions of the progress of the team, what they experienced, and the challenges that they faced. When the successful explorers returned to the U.K. for a heroes' welcoming party, there was a wall of electronic mail waiting for them from children all over the world who had, in a sense, been vicariously experiencing the expedition.

5. pooled data analysis (including surveys)

Information exchanges are particularly powerful when data are collected at multiple sites, then combined for numeric and/or pattern analysis. The simplest of these types of activities involve students electronically issuing a survey, collecting the responses, analyzing the results, and reporting their findings to all participants. *Pooled data* projects have also included:

- water acidity projects, in which rainwater or stream water is collected at different sites, tested for acidity, then examined for patterns over time and distance,
- tele-election projects, coordinated by several different organizations in the months preceding the recent American presidential election, in which students "voted" electronically, and their candidate choice patterns were compared with the national returns,
- the Global Grocery List project, coordinated by David Warlick from the North Carolina Department of Public Instruction, in which students compare prices of 15 standard items (such as rice, sugar, eggs, and unleaded gasoline), then attempt to deduce reasons for price differences,
- the Column Count project, coordinated by Joyce Rudowski, a teacher at the Cincinnati Country Day School, in which students from different cities measure the number of inches devoted to newspaper stories on different topics, then compare space allocations among sites,
- the Tele-Olympics, coordinated by Linda Delzeit from the Cleveland Freenet, in which students at many different schools conducted Olympics-style athletic events, then submitted the statistics generated to determine the winners for each "virtual event,"
- the Eratosthenes Experiment, conceived and coordinated by Jim Meinke, in which students from all around the world re-enacted Eratosthenes' geometric procedure that allowed him to estimate the circumference of the Earth by measuring the shadow angle of a stick placed vertically in the ground at noon on the day of the autumnal (or vernal) equinox,
- and a Monarch butterfly migration project, in which Monarch migration was observed and tracked (by marking the butterflies and collecting samples of migrating butterfly groups)

by students in the eastern U.S., coordinated by Orley Taylor and Brad Williamson, of Kansas State University and Olathe East High School.

Clearly, this type of project holds much promise for involving students in large-scale research efforts that use mathematics to answer complex and interesting questions.

Collaborative Problem-Solving

Problem-solving can take on exciting new dimensions in educational telecomputing environments. Activities can be either competitive or collaborative, but examples of existing projects indicate that teachers and students seem to prefer the latter.

1. **information searches**

In this type of on-line activity, students are provided with clues, and must use reference sources (either electronic or paper-based) to solve problems. For example, Tom Clauset of Winston-Salem, North Carolina, developed the *GeoGame*, in which each of 20 participating groups of students provides the same eight pieces of information about their school's location (i.e., latitude, time zone, population, direction from capital city, etc.). The coordinators of the game then scramble the city names, and all groups use reference materials such as maps, atlases, and books to match the cities with the information sets. The winning class is the class with the most correct matches.

2. **electronic process writing**

Students in Trevor Owen's English classes in Montreal, Quebec (Canada) regularly post the poems that they have written to newsgroups sponsored by Simon Fraser University, so that other students in Canada can offer feedback in an electronic version of *process writing* sessions. Mr. Owen has also been able to enlist the assistance of professional writers, such as the poet Lionel Kearns, to offer constructive criticism...and to receive some of the same, in response to pieces in progress!

3. **parallel problem-solving (including contests)**

With this kind of activity, a similar problem is presented to students in several locations, which they solve at each site, then share their methods electronically. For example, Carmela Federico of New York, NY, presented an architectural challenge on-line as follows:

What's the tallest structure you can build out of 3/4" wide
popsicle sticks that can:

1) support a Grade A Large egg and
2) withstand the Big Bad Wolf Test (the biggest lungs in the room blow on it as long and hard as possible; if the structure stands, it passes)?

We at the Playing to Win Saturday Science Project challenge you to come up with interesting, strong structures to perform this engineering feat!

- Use only Elmer's Glue for adhesive.
- Egg must be hard-boiled, with the shell intact (with yolk inside).

Submit your winning and unusual designs —both written descriptions and either a picture or gif file—to:
[address deleted]
(which is WNET's Learning Link, based in NYC)

In a similar multi-site project, representatives from Tidewater Technology Associates challenged students to "design and construct a launching pad and rocket with recovery system," then "using water and compressed air, launch the rocket, using a raw egg for a payload." They were further instructed to "recover the payload intact" and "use ground-based triangulation to determine the rocket's highest altitude."

4. **simulations**

On-line simulations are perhaps the telecomputing projects that require the most coordination and maintenance, but the depth of learning possible and task engagement displayed by participants can convince project organizers to spend the additional time and effort necessary to make them work. Notable examples of successful on-line simulations include *Centennial Launches*, sponsored by the

Cleveland Freenet's *Academy One* project, which is described in a recent electronic newsletter as follows:

CENTENNIAL LAUNCHES: Simulated Space Shuttle Program
At the core of these launches is a permanent full-scale mock-up of a space shuttle (called the "Centennial") complete with "Mission Control" which is located at University School in Shaker Heights, Ohio (Cleveland area). Schools around the world take various roles in each simulated space shuttle mission. These could include being another shuttle (doing a docking maneuver), secondary mission control, alternate landing sites (weather stations), solar disturbance observatories, and so forth.

Coordination and communications between the shuttle's mission control and other schools will be conducted through distributed conferences on the individual NPTN systems. Electronic mail is sent back and forth, hourly reports are posted, even real-time electronic "chats" can occur between mission control, astronauts, and supporting units.

An exciting series of simulations in international events and issues and global conflict resolution is sponsored by Catherine Schreiber-Jones and David Crookall, of the University of Alabama. Called *Project IDEALS,* these simulations place participating students in the roles of "high-level negotiators representing various countries at an international conference," who must, for example, "hammer out the text of a treaty governing the emissions of CFCs, the use of the ocean's resources, or the future of Antarctica." These exchanges are supported by remote access of sophisticated simulation management software called *Polnet II*, which is located at the University of Alabama.

5. social action projects

It should be no surprise to global citizens living at the end of the 20th century that the Internet can serve as a context for "humanitarian, multicultural, action-oriented telecommunications projects" which involve the future leaders of our planet: our children. The *PLANET Project* ("People Linking Across Networks") involves a consortium of six large Internet-accessible educational networks from which representatives are working together to create collaborative, meaningful social action projects in which children have primary responsibility for learning about and helping to tackle global issues of critical importance.

During the first months of operation, PLANET participants wrote petitions to the United Nations to protest conditions in Yugoslavia, brainstormed ideas about how to address the starvation and political unrest in Somalia, and planned for and carried out fundraising efforts to raise money to help to purchase "rope pumps for villages in Nicaragua that do not have access to clean water." The potential for multidisciplinary, forward-thinking, truly collaborative learning in becoming involved in projects such as these is awesome. As David Nafissian, PLANET Across-Network Facilitator, has written, "a single voice crying out is difficult to hear. But our collective voice can make an impact!"

An Educational Telecomputing Archive

Would you like to learn more about any or all of these innovative educational telecomputing projects? If so, there is an Internet file archive subdirectory made just for you. Use the **ftp** command from your electronic account, or the **ftpmail gateway** service via electronic mail to anonymously access the Texas Center for Educational Technology's server at this address:

tcet.unt.edu

Once connected, look in this subdirectory path:

pub/telecomputing-info/ed-infusions

…to find additional details on many of the activities mentioned above.

As you may have noticed while reading about these projects, the ideas behind them are simple, yet powerful. Their power rests in the interconnectedness that participants experience while they are communicating across what were once geographic and temporal boundaries to collaboratively realize a shared goal. This, along with the energy, enthusiasm, commitment, and *patience* of the teachers and students who help to bring these plans to life, is probably the key to their inspiring success.

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Electronic Impersonations: Changing the Context of Teacher-Student Interaction

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Abstract

The functions of language used by elementary-level children and adult preservice teachers in electronic mail messages exchanged during the exploration of children's literature were coded and analyzed in comparison with published research on language functions used by students and teachers in studies of face-to-face exchanges. Results showed unique patterns of language function exchanged electronically between adults and children.

Electronic impersonation activities in K-12 telecomputing environments offer powerful ways for students to explore literature and history interactively. They also can provide valuable preprofessional experience for preservice teachers. In addition, the results of this research imply that the types and purposes of children's and teachers' language on-line can be very different from that of face-to-face interaction in the classroom.

Characters Online in Nebraska was a telecommunications in education project that involved preservice undergraduate students in education and elementary school classes and their teachers in the state of Nebraska in 1991 and 1992. Participating undergraduate students impersonated characters from children's books through the Internet, communicating in writing with elementary school students reading books featuring the impersonated characters. The texts of the electronic mail messages that the elementary school students, classroom teachers, and preservice teachers exchanged during the course of one semester of project work were analyzed qualitatively in terms of language function (Halliday, 1975). Results indicated that children used heuristic language more frequently than adults, adults used imaginative language more frequently than children, both groups engaged frequently in informal, non-book-related conversation, and neither group used regulatory or instrumental language often. (See Table 1, below.) These patterns are in direct contrast to the previously published results of analysis of face-to-face conversations between adults and children in classrooms.

Table 1
Language Function Data Coding Categories (adapted from Halliday, 1975)

	Function	Definition
1.	INSTRUMENTAL	Language used to request or satisfy needs
	Example: "We wanted to tell you about us."	
2.	REGULATORY	Language used to control other people's behavior
	Example: "Do not let the wolf get out of jail."	
3.	INTERACTIONAL	Language used to establish and maintain relationships
	Example: "Hi, my name is Kelsey..."	
4.	PERSONAL	Language used to give opinions and express feelings
	Example: "You did a very good job of planning a menu filled with healthy foods, and I'm very proud of you!"	
5.	IMAGINATIVE	Language used to pretend or fantasize
	Example: (Goldilocks:) "I found a little baby bird in the forest...I named it Birdilocks."	
6.	HEURISTIC	Language used to find out information
	Example: "Did you get in trouble when you went the shortcut?"	
7.	INFORMATIVE RELATED TO BOOK	Language used to convey information about the book being read
	Example: "The three bears didn't have much of a chance to say anything to me because I jumped out of the window too quickly."	
8.	INFORMATIVE NOT RELATED TO BOOK	Language used to convey information other than that which concerns the book
	Example: "I am 9 and I got one sister and one brother."	
9.	MISCELLANEOUS	Language used for purposes not described in #1 - #8
	Example: "Good news!"	

Note. Categories 7, 8, and 9 emerged from data analysis.

Reference

Halliday, M. A. K. (1975). *Learning how to mean: Explorations in the development of language*. London: Edward Arnold.

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